



Invasive and Exotic Species Management in Klondike Gold Rush National Historical Park

2011 Summary Report

Natural Resource Data Series NPS/KLGO/NRDS—2011/224



ON THE COVER

(Top row from left to right): Jaime Welfelt cuts the seed heads from reed canarygrass at Pullen Creek; An insect pollinating a tall buttercup flower; Volunteers pulling white sweetclover at the Skagway Community Weed Pull located at the Skagway airport. (Second row from left to right): Zachary Goodrich and Sara Cohen try their hand at digging up newly discovered reed canarygrass at Pullen Creek; white sweetclover, a high ranking invasive plant, notorious to Skagway; SAGA crew leader Mike DiNicola uproots tall buttercup in Dyea; A reed canarygrass inflorescence up close.
Photographs by: Klondike Gold-Rush National Historical Park staff

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The National Park Service, Natural Resource Stewardship and Science office in Fort Collins, Colorado publishes a range of reports that address natural resource topics of interest and applicability to a broad audience in the National Park Service and others in natural resource management, including scientists, conservation and environmental constituencies, and the public.

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All manuscripts in the series receive the appropriate level of peer review to ensure that the information is scientifically credible, technically accurate, appropriately written for the intended audience, and designed and published in a professional manner.

This report received informal peer review by subject-matter experts who were not directly involved in the collection, analysis, or reporting of the data. Data in this report were collected and analyzed using methods based on established, peer-reviewed protocols and were analyzed and interpreted within the guidelines of the protocols.

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Abstract

In 2011 the Klondike Gold Rush National Historical Park worked with the Alaska Exotic Plant Management Team to control existing invasive plant infestations and prevent their spread through the park and into the surrounding undeveloped wildlands. The approach to invasive plant management focuses on early detection and eradication in backcountry and undeveloped front country areas and containment on road systems and in the town of Skagway. 2011 was the eighth year of the program and program crewmembers, park staff, and volunteers devoted approximately 1,120 hours to managing invasive species found in and around Skagway and Dyea. The infestations treated in the park this year totaled just over 3 acres. Acres treated outside of park land totaled 8.6 acres. The program dedicates considerable effort to prevent high priority invasive species from spreading from non-NPS lands onto park lands. Ten surveys were conducted in and around the park, along with survey and monitoring efforts in Dyea and Skagway throughout the season. A total of 148.4 acres were surveyed, 49.7 of which were inside park boundaries. A total of 62 infested acres were mapped during the 2011 season, of which 11 were in the park. Discoveries of particular concern include the detection of reed canarygrass (*Phalaris arundinacea*) along the Pullen Creek restoration site in Skagway, and at Sheep Camp on the Chilkoot Trail. Another new discovery of concern was the spread of ornamental jewelweed (*Impatiens glandulifera*) into a municipal park. In past years ornamental jewelweed was found only as planted ornamentals at four locations in Skagway. The infestation of white sweetclover (*Melilotus albus*) at the airport was again found, though diminished from last year. All white sweetclover plants found at the airport were pulled before going to seed. Seventeen volunteers participated in the Skagway Community Weed Pull, removing 118 pounds of invasive plants from the airport medians.

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Finally, the authors would like to acknowledge all of the indefatigable volunteers who worked during the 2011 season to keep Alaska's wildlands pristine at Klondike Gold Rush National Historical Park. Those who attended the Skagway Community Weed Pull, the SAGA youth and adult crews, and the countless citizens that have worked to educate others and control invasive plants throughout Skagway were integral to the success of the program. Their hard work and dedication is greatly appreciated.

Abbreviations

AKNHP	Alaska's Natural Heritage Program
EPMT	Exotic Plant Management Team
GIS	Geographic Information Systems
GPRA	Government Performance and Results Act
GPS	Global Positioning System
KLGO	Klondike Gold Rush National Historical Park
NPS	National Park Service
SAGA	Southeast Alaska Guidance Association
SCA	Student Conservation Association
TIWC	Taiya Inlet Watershed Council
USFS	United States Forest Service

Introduction

Alaska Exotic Plant Management Team (EPMT) crew members have been controlling invasive plants in and around Klondike Gold Rush National Historical Park (KLGO) for eight seasons. Many characteristics of KLGO make the park particularly vulnerable to the introduction and spread of invasive plants. The park is located in the Skagway and Taiya River Valleys, two diverse areas with varied levels of visitor use. Invasive plant colonization and density levels vary greatly by geographic location and proximity to human travel and disturbance making invasive plant management very different in different areas.

The valleys surrounding Skagway contain a multitude of ecological zones ranging from lowland tidal flats to high-alpine meadows due in large part to rapid elevation changes from sea level to over 4000 feet. The Chilkoot and White Passes act as rare glacier-free conduits between the coastal rainforest and the dry continental interior (Hamilton 1994). The historic Chilkoot Trail originates near Dyea and follows the Taiya River up to the Chilkoot Pass into Canada, while the motorized Klondike Highway and the White Pass & Yukon Route Railroad connects British Columbia and the Yukon to Skagway via the White Pass. Both tourism and local road maintenance operations are prime vectors for the spread of invasive plants.

The boundaries of KLGO are unique in that there are three separate units of the park interspersed with private, municipal, USDA Forest Service and state-owned property. The three separate park units are: Skagway Unit, the Dyea-Chilkoot Trail Unit, and the White Pass Unit all of which are connected by road but have few other shared qualities (Figure 1). All three units have varied levels of visitor use and terrain, as well as unique ecology, making invasive plant control different for each location and emphasizing the need to control invasive plants in non-NPS areas adjacent to park property.

The town of Skagway includes the first KLGO park unit that most visitors experience. This bustling tourist town sees approximately 800,000 visitors arrive via cruise ships, ferries, airplanes, and cars during the summer tourist season. Many of these visitors go on to traverse the other park units by car, foot, horse, train, in rafts and on bicycles.

Skagway is also known as the garden city of Alaska. Gardening is a hobby for many citizens of Skagway and with gardening of exotic plants the potential exists for the introduction and spread of invasive plants. Introduction of invasive

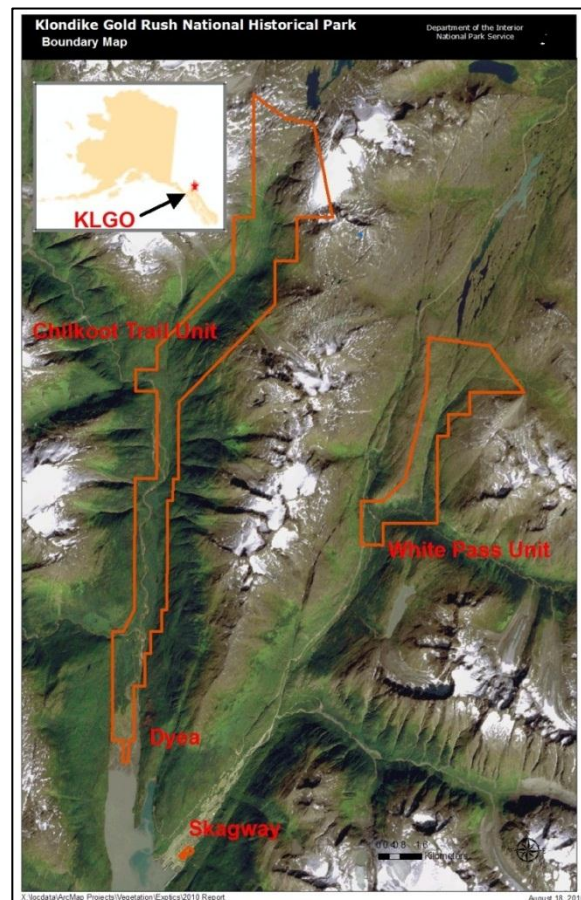


Figure 1. Boundary map of Klondike Gold Rush National Historical Park.

plants to the area in gardens can happen through purposeful planting or the addition of dirt and fill contaminated with invasive seed or rhizome fragments. Garden and ornamental exotic plants have the potential to escape and grow where they are not wanted. This is the case in Skagway where invasive plants have become a problem. EPMT work within the town of Skagway has focused on control of the most aggressive invasive species and containment of the others in order to keep them out of the more remote units of the park: Dyea and the White Pass.

The Dyea Unit of KLGO is connected via the Dyea Road to the city of Skagway and the Klondike Highway. Tour busses, rental cars, bicycles and pedestrians all use this road to gain access to the former town of Dyea and the Chilkoot Trail. Many guide companies accompany tourists to the area to go hiking, rafting, or horseback riding through the park. The infestations of invasive species in the Dyea Unit are mostly contained to disturbed fill sites and roadsides. Monitoring and control work has been emphasized in Dyea to keep infestations small and catch any possible invasive species that have traveled via the road system before they expand and become extremely difficult to manage.

The White Pass Unit of the park is the most remote unit of KLGO. East of the Klondike Highway, this unit is mainly accessible via the popular White Pass & Yukon Route Railroad. This is the only way visitors see the White Pass Unit save for very few intrepid hikers. The possibility for invasive species in the White Pass Unit is mainly confined to areas closest to the Klondike Highway and near the train tracks. Up to 12 train's transverse the railroad on a busy day during the summer season.

KLGO has implemented the first stages of invasive plant management at the park. Program milestones of the past eight years include—an accurate inventory of invasive plants in and around the park, the implementation of an annual monitoring plan, and the implementation of a fast-acting control plan for emerging infestations. Specifically, the KLGO EPMT has focused on early detection and eradication of small infestations throughout the park, periodic inventories of the White Pass Unit and Chilkoot Trail, and monitoring and control of invasive species in Dyea, Skagway, and along the Dyea Road. This early response approach to emerging infestations coupled with increased public education and awareness has helped to keep the threat of invasive species manageable in KLGO.

This report details the status of invasive plants in and around KLGO and draws conclusions on best management practices for the future of invasive plant management in the area.

Methods

The KLGO EPMT staff used previous reports and recommendations and adapted them to this season's phenology and available labor to prioritize infestations and species, select equipment, choose control methods, and manage personnel. Methods of mapping and data collection were taken from the Alaska EPMT 2011 Field Protocol (Million and Rapp 2011). Cultural resource protection methods followed procedures laid out in 2010 compliance documents. KLGO archaeologist Shawn Jones laid out the basic field procedure for the KLGO EPMT crew to follow. Tools were selected that would do the least amount of damage to any potential cultural resources that could be uncovered or just buried under the work site while conducting control work in the Dyea townsite (Figure 2).



Figure 2. Digging tools utilized during control work near cultural resource sites.

Objectives

The KLGO EPMT's objectives for the 2011 season were as follows:

1. Monitor and control infestations of high priority in Dyea.
2. Monitor and contain highly invasive infestations in Skagway and elsewhere.
3. Keep infestations in Skagway and along the Dyea Road from expanding, especially those not present in other areas of the park.
4. Survey backcountry areas of the park for any invasive species.
5. Educate both the local and visiting public on the threat invasive species pose to Alaska's native ecosystems.

Control of individual infestations was prioritized based on the location of the infestation and the invasiveness ranking of the invasive plant in question. Invasive species with higher invasiveness rankings were considered a priority for management. The invasiveness rank is a 1 to 100 scale which incorporates four categories on each species: potential impacts to the ecosystem, biological attributes such as growth rate and method of reproduction, distribution, and effective control measures (Carlson et al. 2008). Control efforts have been designed to contain invasive plants to Skagway and the surrounding road system, while infestations growing in undeveloped front country and backcountry park areas have been targeted for eradication. The combined prioritization of invasiveness ranking and geographical location create a monitoring and control strategy with the goals of stopping the spread of invasive species coming from Skagway to other areas of the park and into the surrounding wild lands.

Defining Work Areas

To make planning control efforts more manageable, the park and its surroundings were divided into six work areas. Results and recommendations in this report are divided by work area and were mapped along with the primary invasive species for that section. A map of surveys conducted along with work areas can be found in Appendix G. The six work areas are:

1. Nelson Slough Restoration Site
2. The Chilkoot Trail
3. Dyea
4. The Dyea Road
5. Skagway
6. The Klondike Highway and White Pass Unit

Highest priority was placed on eradicating infestations from park land in the first three areas, and the concern in the other three areas outside the park emphasized keeping invasive plants from spreading into the adjacent park. While the Nelson Slough and Chilkoot Trail are in the Dyea Unit of KLGO, the Nelson Slough restoration site is treated separately due to the high concentration of invasive species. The Chilkoot Trail is treated separately because of its remote location.

Prioritizing Species

Discussions in 2006 between KLGO Natural Resources staff and Alaska Regional EPMT staff resulted in a list of the following six high priority species: bird vetch (*Vicia cracca*), common tansy (*Tanacetum vulgare*), white sweetclover (*Melilotus albus*), oxeye daisy (*Leucanthemum vulgare*), yellow toadflax (*Linaria vulgaris*), and narrowleaf hawksbeard (*Crepis tectorum*). These plants are all considered species of greatest concern in Alaska (Carlson et al. 2006). Two other species of high priority were ornamental jewelweed (*Impatiens glandulifera*) and reed canarygrass (*Phalaris arundinacea*) because of their high invasiveness ranking and newly discovered infestations, both on and off of KLGO park land. Along with these species, common eye-bright (*Euphrasia nemorosa*) was recognized as a local species of priority, due in large part to its limited distribution and recent appearance within park lands.

The 2011 KLGO EPMT adopted the work plan formulated in the 2006 management strategy recommendations following many of the changes that were implemented in the 2010 management plan, though several changes were incorporated to account for new conditions. The high priority species bird vetch was monitored again this season but not treated by hand pulling as deemed ineffective in prior years' reports. Work on bird vetch may be done in conjunction with the Taiya Inlet Watershed Council (TIWC) as well as the municipality of Skagway in 2012. Another species, ornamental jewelweed, was monitored and pulled in parts of Skagway. Additionally, tall buttercup (*Ranunculus acris*) and creeping buttercup (*Ranunculus repens*) were listed as species to control in park boundaries for the 2011 season because they are still at a relatively manageable level in the park, where minimal amounts of only four of the high priority species mentioned above exist. In some areas of the park, buttercup infestations were dense enough to threaten native plant communities. The full list of invasive species identified by the park can be found, listed with common and scientific names, in Appendix A. Graphs created for use of species prioritization in 2012 can be found in Appendices D and E.

Tools for Identification and Data Collection

The primary field guides referenced for plant identification were Flora of the Pacific Northwest (Hitchcock and Cronquist 1987) and Plants of the Pacific Northwest Coast (Pojar and Mackinnon 1994). Flora of Alaska and Neighboring Territories (Hulten 1968) was used to confirm plant identification. Illustrated Flora of British Columbia (Douglas et al. 2001) was also used periodically for identification. Most of the plants encountered were also available at the KLGO herbarium, as well as the KLGO natural resources pressed invasive plant collection, started in 2010.

Spatial data on the invasive plant infestations were collected using two GPS units, the Juniper Systems Archer, and the Trimble Recon datalogger with either the Trimble GPS Pathfinder XB Bluetooth receiver or the Trimble ProXT and Trimble Hurricane L1 antennas. Each of these units is set to be accurate within zero to five meters in compliance with the 2011 Alaska EPMT field protocol (Million and Rapp 2011). Trimble GPS Pathfinder Office 5.0 was used to differentially correct positions with the CORS Gustavus, AK or CORS Skagway, AK base station data and then edit the data.

Collected GPS data were sent to the regional Alaska EPMT staff every two weeks. The regional staff converted the GPS data to GIS shapefiles for use in KLGO GIS projects and the Alaska Regional invasive plant geodatabase.

Control Methods

The primary control method employed for invasive plant removal was hand pulling, occasionally with small hand tools which allowed for the most selective and low impact control. The greatest concern with this method was that the entire root system be removed with the plant. Plants with just a single tap root pulled easily, but those with rhizomatous root systems needed special care to remove the entire root system. Many invasive plants can grow back from just a small portion of root left in the soil. This has been observed in previous years with common tansy, yellow toadflax and oxeye daisy.

All removed plants were bagged on site, weighed in the KLGO maintenance building, and picked up by KLGO maintenance staff to be burned in the Skagway city incinerator. This method ensured the least amount of seed dispersal between locations. Care was also taken to ensure bags used in town were not reused outside of Skagway due to the possibility for unwanted seed dispersal.

A bicycle and trailer were used as the primary transportation method for weed waste in Skagway, freeing up vehicle use for other NPS employees. Bicycles from the KLGO bicycle fleet were also often used for conducting road surveys along the Klondike highway and Dyea road, and for transportation to survey sites (Figure 3).



Figure 3. Bicycle trailer with bags of reed canarygrass seed heads at Pullen Creek.

A new discovery of reed canarygrass on the Chilkoot trail prompted different control methods as the infestation was too large to be reasonably controlled by digging the dense rhizomatous root systems safely. A plan was developed and shade covers were weighted with rocks and staked down in place over the infestations for solarization (baking plants under trapped solar heat), and to starve plants of sunlight. Covers consisted of a black plastic layer and a black non-woven geotextile layer on top. Covers need to be in place for at least one growing season, but ideally should be left for two as some seeds may still be viable after the first year. The site should be monitored at least once per season to monitor covers and to check progress after covers are removed. Sheep Camp was the only place where covering was used as a method for invasive plant control in 2011.

The use of chemicals for control is not widely employed by the NPS in Alaska at this time. The Alaska Region Invasive Plant Management Plan contains a protocol for employing the use of chemical control. This plan was utilized this year to treat large, high priority infestations at several parks, but was not employed at KLGO. The Taiya Inlet Watershed Council (TIWC) in partnership with the municipality of Skagway may consider the use of herbicides to high priority infestations outside of the park during the 2012 season.

Personnel

The 2011 KLGO seasonal EPMT staff was smaller this year than it was in 2010, but many of the same events and groups that volunteered over prior years helped to make it a very successful season. SAGA (Southeast Alaska Guidance Association) is an AmeriCorps affiliated non-profit organization that conducts service projects throughout the state of Alaska. A youth SAGA crew worked with the KLGO EPMT Crew from June 27-July 1 as well as July 18-22, 2011. Additionally, the Skagway Community Weed Pull, held on July 1st, recruited seventeen volunteers who controlled the entire white sweetclover infestation found within the airport boundaries. This infestation was drastically reduced from last year's weed pull, which gave volunteers time at the end to pull a large and dense stand of narrowleaf hawksbeard.

Results

Overview

The 2011 KLGO EPMT staff and volunteers inventoried 62.4 acres and treated or retreated 11.6 infested acres within and around the park. A total of 696 field person hours were logged by KLGO EPMT staff and volunteers this season. The KLGO EPMT crew spent a total of 802 person hours working on a number of different activities including: control work consisting of all removal work; GIS and GPS work including mapping infestations, uploading and editing rover files and managing GPS units, and survey time; and office and administrative tasks which includes data management, research, report writing, planning, outreach, training and travel.

The park also tracks control work by acreage, measuring the season's accomplishments against goals set for the invasive plant management program in accordance with the Government Performance Results Act (GPRA). The park sets goals for the acres of previous infestations found to be eradicated, the size of infestations that are being controlled, and the acreage of the plants actually pulled. The KLGO EPMT matched or exceeded all of the GPRA goals set for the park in 2011. Tables 1 and 2 summarize KLGO EPMT work conducted in 2011. Changes in gross species acres between 2009 and 2011 are summarized in Appendices B and C. Specific results are address by work area in the sections below.

Table 1. Summary of Klondike-Gold Rush National Historical Park Exotic Plant Management Work.

Year	Invasive GPS Data* and GPRA Goals - NPS Lands(non-NPS lands)					
	Species Acres Surveyed	Species Acres Infested	Acres Treated		Canopy Acres Controlled	
			Actual	GPRA Goal	Actual	GPRA Goal
2004	43.531 (52.497)	7.838 (6.842)	0.792 (1.505)	-	-	-
2005	3.106 (6.450)	3.099 (2.617)	0.732 (2.436)	-	-	-
2006	63.145 (74.350)	4.577 (2.308)	2.912 (0.726)	-	-	-
2007	1.481 (7.673)	0.487 (5.513)	0.011 (1.676)	-	-	-
2008	5.842 (47.974)	2.063 (22.159)	0.235 (1.351)	0.5	0.5	0.1
2009	11.931 (83.259)	2.453 (21.645)	0.388 (2.504)	0.5	0.6	0.6
2010	34.638 (245.513)	3.914 (56.212)	0.502 (9.362)	0.5	0.8	0.7
2011	49.720 (98.718)	11.278 (50.695)	3.045 (8.583)	0.5	0.8	0.8

* All acreage was calculated using January 2011 NPS land status. Acres infested are calculated by acres mapped multiplied by the percent cover in areas greater than or equal to 0.5 acres. If under 0.5 acres, acres mapped is counted as 100%. Acres treated are calculated by taking the acres infested that were labeled as treated and applying the percent of the infestation treated.

Table 2. Summary of the 2011 infested acres in Klondike Gold Rush National Historical Park.

Species		AKEPIC ranking	Chilkoot Trail	Dyea	Dyea Road	Klondike Hwy	Skagway	White Pass
Latin Name	Common Name							
<i>Bromus inermis</i>	smooth brome	78	-	-	-	0.004	-	-
<i>Capsella bursa-pastoris</i>	shepherd's purse	40	-	-	0.0001	0.049	0.217	-
<i>Cerastium fontanum</i>	mouse-ear chickweed	36	-	-	0.023	0.012	0.001	-
<i>Chenopodium album</i>	lambsquarter	37	-	-	-	0.041	1.118	-
<i>Crepis tectorum</i>	narrowleaf hawksbeard	56	-	-	0.365	0.057	5.320	0.0001
<i>Elymus repens</i>	quackgrass	59	-	-	0.090	0.014	0.248	-
<i>Euphrasia nemorosa</i>	common eye-bright	42	-	0.484	-	-	-	-
<i>Hordeum jubatum</i> ¹	foxtail barley	63	-	0.186	-	0.078	0.982	0.012
<i>Impatiens glandulifera</i>	ornamental jewelweed	82	-	-	-	-	0.022	-
<i>Leucanthemum vulgare</i>	oxeye daisy	61	-	0.211	0.016	0.121	0.0001	-
<i>Linaria vulgaris</i>	yellow toadflax	69	-	0.0001	0.066	0.013	1.424	-
<i>Matricaria discoidea</i>	pineapple weed	32	-	-	1.426	0.049	0.403	-
<i>Melilotus albus</i>	white sweet clover	81	-	-	-	0.035	1.669	-
<i>Phalaris arundinacea</i>	reed canarygrass	83	0.027	-	0.007	0.009	0.650	-
<i>Phleum pratense</i>	common timothy	54	-	-	0.0001	0.0001	0.005	-
<i>Plantago major</i>	common plantain	44	-	1.971	3.645	0.041	0.693	-
<i>Polygonum aviculare</i>	prostrate knotweed	45	-	-	-	0.049	0.002	-
<i>Ranunculus acris</i>	tall buttercup	54	0.001	3.410	0.386	0.007	1.478	0.012
<i>Ranunculus repens</i>	creeping buttercup	54	-	0.031	0.004	-	0.028	-
<i>Rumex acetosella</i>	common sheep sorrel	51	-	1.220	2.165	0.002	3.218	-
<i>Rumex crispus</i>	curly dock	48	-	0.0001	-	-	-	-
<i>Senecio sylvaticus</i>	woodland groundsel	41	-	-	-	-	0.001	-
<i>Senecio viscosus</i>	sticky ragwort	-	-	-	0.187	0.064	0.359	-
<i>Silene noctiflora</i>	nightflowering silene	42	-	-	-	-	0.003	-
<i>Stellaria media</i>	common chickweed	42	-	-	-	-	0.001	-
<i>Tanacetum vulgare</i>	common tansy	60	-	-	0.0001	0.0001	0.002	-
<i>Taraxacum officinale</i>	common dandelion	58	-	1.498	3.306	0.014	2.105	1.354
<i>Thlaspi arvense</i>	field pennycress	42	-	-	-	0.0001	-	-
<i>Trifolium hybridum</i>	alsike clover	57	-	0.0001	0.248	-	0.147	-
<i>Trifolium pratense</i>	red clover	53	-	1.262	0.552	-	3.370	-
<i>Trifolium repens</i>	white clover	59	-	2.949	3.540	-	3.711	1.354
<i>Tripleurospermum inodorum</i>	scentless false mayweed	48	-	-	-	-	0.0001	-
<i>Vicia cracca</i>	bird vetch	73	-	-	-	-	0.001	-

Infested acres are calculated by acres mapped multiplied by the percent cover in areas greater than or equal to 0.5 acres. If under 0.5 acres, acres mapped is counted as 100%. Acres treated are calculated by taking the acres infested that were labeled as treated and applying the percent of the infestation treated.

1-Foxtail barley has, until recently, been considered a non-native. However as of 2010 it is being considered as a native to Alaska but may still be controlled in certain areas due to the impacts on domestic animals.

Nelson Slough Restoration Site

Native plants in the restoration site are thriving despite the presence of invasive species. Common dandelion (*Taraxacum officinale* ssp. *officinale*), common plantain (*Plantago major*), red clover (*Trifolium pratense*), white clover (*Trifolium repens*) and alsike clover (*Trifolium hybridum*) exist on the ground along the edges of the restoration site along with native Nootka lupine (*Lupinus nootkatensis*) and wild-flag iris (*Iris setosa*). The aforementioned invasive species were not a focus of regular control because the natives appear to be unaffected by the invasive ground cover. One small patch of common eye-bright (*Euphrasia nemorosa*) was detected and controlled on the edge of the site near the bridge and picnic area. Cover of eyebright was reduced from last year, and eradication is a possibility for next year for this occurrence.

Tall buttercup (*Ranunculus acris*) was controlled in the restoration site by SAGA crews for 19.5 hours in June, and was revisited in July for 15 hours to remove any missed or newly flowering plants. The site was surveyed thoroughly both north and south of the foot bridge at the entrance to the Dyea townsite. Density of the tall buttercup infestations seemed to be down from 2010 in the restoration site, and most of the buttercup growing was found in small, manageable patches in the slough (Figure 4).



Figure 4. Tall buttercup growing in the Nelson Slough north of the restoration site.

On a brief walk through the site in early September with visiting Alaska Plant Material Center botanist Mike Duffy, doing seed collection for BLM’s “seeds for success” program, a species new to KLGO, meadow foxtail (*Alopecurus pratensis*) was discovered growing in the slough a few meters south of the footbridge.

Invasive plants found in the Nelson Slough area, including those at the restoration site, are included in the map of Dyea in Appendix H.

Chilkoot Trail

The Chilkoot Trail was surveyed for the second year in late August. Three volunteers were employed to help monitor the trail for the low priority invasive plants recorded last year and also to help control a reported infestation at Sheep Camp. Data were collected from the trailhead to Sheep Camp with few invasive species found. Lower priority species such as common dandelion and white clover recorded last year at Canyon City and at Sheep Camp were not found this year possibly because the survey was conducted so late in the season.

During a Chilkoot trail hike in early July, tall buttercup was found in a few small patches across the Sheep Camp campground and mapped with a GPS. An hour of control work was all it took to control all patches of tall buttercup found in the campground and on the trail just south of the campground. These infestations were pulled well before going to seed.

The highest priority concern this season was a new reed canarygrass infestation discovered at the Sheep Camp campground. A report from the visiting Alaska Natural Heritage Program vegetation mapping crew prompted investigation and control work. During the survey of the trail

with volunteers, the infestation found proved to be much too large to dig out by hand, so all inflorescences and seed heads were cut, bagged, and burned in the Sheep Camp ranger station incinerator.

A second trip up to Sheep Camp was conducted after the newly developed treatment plan passed compliance. Infestations of reed canary grass were cut down to ground height with a hand tool, and were covered by two layers of material. A layer of black plastic sheet was cut and placed down over the infestations, along with a layer of black non-woven durable geotextile placed overtop to withstand the weather and abuse in the high traffic area (Figure 5). The covers were cut to size, leaving at least a foot of space covered along the outside of each infestation, then staked down into place with care to not damage potentially buried artifacts. Large rocks were placed on the tops of the covers along the perimeter and on the inside to further hold them in place. Signs were created to be placed in front of each set of infestations to inform hikers about the project and to leave the covered areas undisturbed. A poster with a more detailed explanation of the project, as well as information about reed canarygrass and its biological attributes, was created and hung in the two Sheep Camp campground warming shelters as well as outside the ranger station.



Figure 5. Tarping project to control reed canarygrass at Sheep Camp.

All infestations found in the Sheep Camp area were recorded with a GPS. Patches of white clover and dandelion found at Canyon City last year were not detected this year. This may be because the survey was conducted so late in the season. A map of the sheep camp infestations and control work done at Sheep Camp can be found in Appendix N.

Dyea

The Dyea unit continues to be the focal point of invasive plant management in KLGO. It is the most heavily used and accessible natural site in the park. Except for common dandelion and one or two species of lesser concern, the invasive plant infestations lie in disturbed sites adjacent to roads. Large-leaf lupine (*Lupinus polyphyllus*) was not detected for the second year in a row, in two small patches where it had been recorded and controlled in 2009, suggesting eradication. The creeping buttercup monitored and controlled in 2009, though not found in 2010, was found again this year at the lost lake trailhead. A patch of a few small plants just before the main trail starts uphill was recorded and removed. The entire trail was surveyed but nothing was found except creeping buttercup and tall buttercup at the trailhead. The narrowleaf hawksbeard infestation between the Taiya River Bridge and campground, found decreasing over the past two years was not detected in 2011.

Both species of buttercup continued to be the focal point of control in Dyea for the 2011 season. Very few high priority species exist within the park boundaries, and the buttercup infestation is rampant in Dyea along human travel corridors, as well as some areas on the far north end of the flat. Buttercup is easy to identify, monitor, and control and has an invasiveness ranking higher than many other lower priority infestations such as white clover, red clover, sheep sorrel (*Rumex acetosella*), pineapple weed (*Matricaria discoidea*), and common plantain. Much of the buttercup found seems to follow the path that the horse tours take throughout the Dyea area (Figure 6). It seems that the horses, potentially eating plants and seeds along the route may be a contributing factor to the spread of both species of buttercup in Dyea.



Figure 6. SAGA crews surveying the horse trail in Dyea.

A meadow south of the Nelson Slough restoration site received multiple days of SAGA crew control this season. The meadow is full of thriving native plants but also an increasing amount of tall buttercup. This meadow is also the location of the only infestation of yellow toadflax in Dyea. A SAGA crew spent three half days uprooting tall buttercup starting at the edges of the infestation. The SAGA crew spent one half day removing flower heads of all buttercup not uprooted. The KLGO EPMT monitored and controlled the small yellow toadflax infestation which consisted of only a few small plants.



Figure 7. A tall buttercup infestation in Dyea growing amongst native wild iris.

The entire length of the Dyea town site road was surveyed and controlled by the SAGA crew. SAGA spent two half days on digging tall buttercup along the road and another half day clipping flower heads of buttercup in one large patch on the south side of the road halfway between Dyea Road and the townsite. Almost all tall buttercup found was located along the eastern half of the road (Figure 7).

The SAGA crew also spent 30 person hours surveying and removing flower heads of tall buttercup along the Dyea road section between the Taiya River Bridge and the West Creek bridge. SAGA, along with two volunteers staying

at the campground, spent three and a half hours surveying for and uprooting tall buttercup and creeping buttercup in the NPS campground and along the Dyea road from the campground entrance to the Taiya River bridge.

The patch of oxeye daisy on the east side of the Dyea road north of the Taiya bridge was visited several times throughout the season, and all plants found were uprooted before they had gone to seed. This patch was controlled by the SAGA crew during the survey for tall buttercup along the road. One small patch of only a few plants was found up the Dyea road north of the townsite road, and was uprooted by SAGA.

Other control work and survey work in Dyea consisted of surveying parts of the old Dyea townsite trails and municipal campground roads. A few small patches of tall buttercup were located and removed in these areas. A survey of the large field on the north end of the Dyea flats was conducted by the SAGA crew in June by fanning out across the field. Many patches of tall buttercup were found and uprooted by SAGA during the survey. The SAGA crew returned to the site for half a day in July and uprooted the rest of the infestation.

Two species found widespread across the Dyea flats include foxtail barley (*Hordeum jubatum*) and sheep sorrel. Smaller segments of these infestations were mapped near the northern/central part of the Dyea flats although many areas throughout the flats were not mapped due to time restraints. Native vegetation throughout most of the flats is flourishing, so priority was not to trample too much of this during surveys, especially on the lesser traveled south end of the Dyea flats (Figure 8). The non-nativity of foxtail barley has been recently debated and is therefore a low priority for management in this park (AKNHP 2011).



Figure 8. SAGA crews survey a large field north of the Dyea flats for invasive plants.

Common eye-bright was recorded again in Dyea in three areas, most of the infestations were contained to highly trafficked areas. Two of the three areas were treated this season. A less traveled section, with large extent of eyebright, was treated along its southern and western edges to control and contain the infestation. A small patch in the Nelson Slough restoration site was controlled and targeted for eradication. The untreated common eye-bright infestation is located on a horse trail next to a parking lot, in a highly disturbed area. This area also contains infestations of red, white and alsike clovers. The common eye-bright in this spot is relatively contained, not choking out other native plants and therefore received less control work.

A map of invasive plant species in Dyea can be found in Appendix H.

Dyea Road

The entire Dyea Road was surveyed on bicycle this season over two days. The survey was conducted in late July and spanned from the intersection of Dyea Road and the Klondike Highway to the NPS campground in Dyea. Each side of the road was surveyed separately. West Creek road was not surveyed this year due to the small number of low priority species found last year. Narrow-leaf hawksbeard and tall buttercup were found in scattered patches along the Dyea Road, while yellow toadflax was located on the two mile stretch of road nearest Skagway. A

very small reed canarygrass infestation was found near the AB Mountain Trailhead, and seemed to have not spread past last year's extent.

The infestations of oxeye daisies existing on Dyea Road were contained to the areas they were found in last year. Most of the infestation is located on private land on which landowners in past years have strongly objected removal, so no control work was done. A new patch was found at the end of Nahku Bay on both sides of the road along private property.

Invasive plant control is particularly important on the Dyea Road because the road can act as a conduit for plants introduced in Skagway to reach KLGO's most heavily used park lands. Yellow toadflax is common in Skagway gardens and has been spotted moving further along the Dyea Road over the last few years. This scenario could happen with other invasive plants in the years to come making monitoring, control and prevention on the Dyea Road a vital part of KLGO invasive plant management. The past prevalence of white sweetclover along the Klondike highway and in Skagway serves as a reminder of how quickly the plant could spread into park lands via the Dyea Road. Control of invasive plants on the Dyea Road can also be difficult, due to the fact that much of the land adjacent to the road is private property.

A map of invasive plant species on the Dyea Road can be found in Appendix I.

Skagway

The busy garden city of Skagway continues to be overwhelmed with invasive plants. A concerted effort between the park, local government and residents would be necessary to address the underlying causes of the problem: private gardens where invasive ornamentals are planted but not contained, and disturbed or bare soil on public property where spreading plants can establish themselves. The Taiya Inlet Watershed Council (TIWC) continues to be an instrumental partner on monitoring and control work throughout the town. With so many existing infestations, KLGO and TIWC's goal in past years and in 2011 was to contain the problem—stop the spread of invasive plants to park and wilderness lands outside of town, by controlling the most highly invasive plants in high-traffic areas. It is important to distinguish the terms “invasive” and “exotic” especially in Skagway. Skagway is now home to many exotic plants, many of which are planted in gardens. Focus should be placed on controlling and containing invasive plants found in gardens or elsewhere (or replacing with similar native species). It is not a time or energy worthy policy to try and eradicate all exotic (non-native) species from the area. A map of invasive plant species in Skagway can be found in Appendix J.

The surveys of Skagway this season showed that the town continues to be a source of invasive species. Of the six species of concern identified in 2006 – narrowleaf hawksbeard, common tansy, yellow toadflax, oxeye daisy, bird vetch, and white sweetclover – all were observed last year and reappeared this season (Schultz 2006). Additionally, the highly aggressive ornamental jewelweed was found in four locations around town. Three sites were located on private property and simply monitored and the fourth was controlled in a town park. An new reed canarygrass infestation was also discovered, densely covering a stretch of Pullen Creek.

White sweetclover continues to be the main focus in Skagway, and was greatly reduced from last year. The vast majority of white sweetclover in the area is located within the city of Skagway, on the far west side of town. Infestations have been found in the airport medians, inside and around

the airport fence, on private property adjacent to the airport or close by, and on northern banks of the Skagway River. Density of white sweetclover continues to be highest at its southernmost limit.

In 2011, densities of white sweetclover in the airport medians decreased from 2010. Plants were also found sparsely on both sides of the fencing, around the terminal and in the parking lot. The infestation was controlled before any plants had gone to seed thanks to the work done by volunteers during the Skagway Community Weed Pull (Figure 9). In addition to white sweetclover, yellow toadflax and narrowleaf hawksbeard were targeted during the last hour of the event.

Efforts to locate and pull white sweetclover in the areas around the airport were undertaken by two concerned long time community residents, Joanne and Andrew Beierly, who have been keeping their eyes out for the past several years. White sweetclover pulled by the Beierlys was mapped and included in KLGO EPMT data.



Figure 9. Volunteers pull white sweetclover during the Community Weed Pull.

There were two larger infestations of white sweetclover on the north end of town which were monitored though not controlled as they were often being mowed down in yards on both private and municipal land. Aside from this, all of the white sweetclover plants found by KLGO EPMT staff in Skagway were pulled before going to seed.

Three SAGA crew days, for a total of 97 person hours, were spent controlling infestations outside of the airport fence along the northern section, as well as alongside the Skagway River near the high school. The KLGO EPMT staff also spent several days controlling the infestations along the north side of the airport fence and along the Skagway River at the north end of town. The invasive species mapped and pulled were narrowleaf hawksbeard, yellow toadflax, white sweetclover, oxeye daisy, tall buttercup, creeping buttercup, and night flowering silene (*Silene noctiflora*).

A large yellow toadflax infestation was found around the KLGO maintenance building and yard. A day was spent by KLGO EPMT staff controlling this infestation, along with narrowleaf hawksbeard and tall buttercup. The maintenance yard is an important site for regular future treatment, as it contains material and equipment that are often transported to other areas of Skagway as well as inside of park boundaries in Dyce.

Invasive plant species continue to be prevalent in and around the Pullen Creek restoration site and pond. The most important discovery of the season in Skagway was a very dense, tall stand of reed canarygrass along a southern section of Pullen Creek, north of congress way, and south of the dewey trailhead bridge. A digging experiment was conducted to gauge how much time digging out the infestation at Pullen Creek would take. Three hours each (9 person hours) were

spent by one SCA EPMT staff, one NPS staff, and another SCA staff member digging out a very small section of reed canarygrass on the southernmost end of the infestation at congress way. Digging and uprooting proved to be an unfeasible method of control for EPMT staff due to the density and extent of the infestation, the danger of leaving or spreading root fragments down the stream, as well as the need for immediate re-vegetation of the area after digging. A summary of the infestation, along with potential treatment options, were discussed with the TIWC at a board meeting. The TIWC is attempting to create an invasive plant internship position for 2012 to monitor and control invasive plants in the municipality of Skagway, particularly along Pullen creek and the Skagway and Taiya rivers. High priority infestations outside of KLGO's boundaries, such as infestations of reed canarygrass and bird vetch, may get full attention in 2012 with a dedicated invasive plant specialist. A map of the reed canarygrass infestation at Pullen Creek can be found in Appendix M.

The SAGA crew spent two half-days pulling invasive plants at the Pullen Creek locations. One half day was spent pulling tall buttercup, creeping buttercup, and narrowleaf hawksbeard. Another day was spent searching for and removing any flower heads found in the very dense stand of reed canarygrass that were missed before. The SAGA crew also spent two weeks doing re-vegetation work with the TIWC, part of which involved transplanting alders into the location where reed canarygrass was dug out by EPMT, NPS, and SCA staff (Figure 10). The white sweetclover that was found and pulled along Pullen Creek in 2009 was not detected in 2010 or 2011.

Perennial sowthistle (*Sonchus arvensis*) another high ranking species to the area, was not detected in any of its previously recorded locations near the north and south ends of the airport, or in the airport medians. Thorough control work done in 2009 and 2010 on this species may have reduced it to a small enough extent where it was not detected this season, or the species may have been eradicated (though not likely due to its former extent in Skagway in 2009 and 2010). Thorough monitoring for perennial sowthistle in 2012 is important to determine the status of this high ranking species in Skagway.

Ornamental jewelweed was found in multiple locations in Skagway and bird vetch (*Vicia cracca*) was found on municipal property at 9th and Spring Street. Both species are highly invasive and currently found only in town, great reasons to control them as soon as possible. Some progress was made this year with the ornamental jewelweed, while the bird vetch remains untouched due to ineffective results with hand pulling in past years. Bird vetch has been contained to the same area and has not seemed to spread in extent. Ornamental jewelweed has been found in 5 locations in Skagway in 2011. Four locations were on private property, and one



Figure 10. SCA interns Zach Goodrich and Sara Cohen dig reed canarygrass at Pullen Creek.

was on Skagway municipal land in the public park on 6th street next to Pullen Creek. The infestations in the park were pulled before going to seed, and infestations on private property were not treated. Dennis Corrington of Corrington's Alaskan Ivory, which has ornamental jewelweed planted outside the shop, was informed about the nature of this species, and refused removal. The owner also admitted to having spread seeds into the public park where the jewelweed was found outside of private property. Corrington was informed of the negative effects ornamental jewelweed can have especially on riparian and wetland ecosystems. Monitoring the park and other parts of Pullen Creek will be a priority for work in 2012.

The Klondike Highway and White Pass Unit

The Klondike Highway and White Pass & Yukon Route Railroad both run through the White Pass Unit into Skagway. Both corridors connect Canada to Skagway and have the potential to serve as a means for invasive plant introduction. During personal visits to the Yukon, vast stretches of white sweetclover and other invasive plants were observed and informally noted by KLGO EPMT crew along the Klondike and Alaska Highway. Alfalfa (*Medicago sativa* ssp. *sativa*), an invasive species not yet found in the Skagway area, was informally recorded along the Klondike Highway and in British Columbia. These larger scale infestations have the potential to spread over the pass into the U.S. along both the tracks and highway, given the right opportunity.

Both sides of the 12 mile section of the Klondike Highway were surveyed thoroughly this season by bicycle between the Dyea Road and the U.S.-Canadian border. Low priority infestations were not mapped due to the time required to map such a long stretch of road. All medium-high priority infestations, as well as invasive plants considered more rare to the Skagway area were mapped.

The two highest ranking species in the Klondike Highway/White Pass area are reed canarygrass and white sweetclover. Reed canarygrass was found in multiple places along the highway, on both the east and west sides of the road. All infestations were fairly small, and large scale spread of the grass is not yet an issue. White sweetclover was recorded growing up the hill into a private rock quarry owned by Jeff Hamilton and along the road at its entrance, just up the Klondike Highway 1-2 miles north of the intersection with Dyea road. A single large white sweetclover plant was found near the summit of white pass on the highway in a pull-off just south of mile marker 14 (Figure 11). The solitary plant was pulled.



Figure 11. White sweetclover found along the Klondike Highway

A very small infestation of yellow toadflax was found around the summit marker sign on the east side of the road and was also removed. Another few small infestations of yellow toadflax were found on the western side of the road near mile 12 at the highway maintenance station. All recorded yellow toadflax on the northern section of the highway adjacent to the White Pass Unit were removed.

A larger infestation of oxeye daisy, mixed in with thick native vegetation, was recorded on a roadside pull-off just north of mile marker 10 on the east side of the road. The infestation was not pulled because of its size and discovery late in the season, but would be a good candidate for SAGA work in 2012.

A small patch of common tansy was found on the east side of the highway between mile 8 and 9, flower heads were clipped and bagged to prevent the plant from going to seed.

During a seed collection project, visiting Botanist Mike Duffy spotted a new exotic species to the park, canada bluegrass (*Poa compressa*), a few meters up the runaway truck escape ramp just south of Bridal Veil Falls. Narrow-leaved collomia (*Collomia linearis*) was also found in one spot on the highway adjacent to the quarry.

A survey of the White Pass Unit was conducted in early August. One KLGOEPM staff member and an NPS seasonal employee hiked into the unit from the Klondike highway to conduct surveys. Small amounts of white clover (not white sweetclover) and common dandelion were the only thing found in the White Pass Unit. All invasive plants found in the White Pass Unit were found only along the train tracks. Only the northern most 1.5 miles of U.S. track were safe to survey, as track south of this runs along a rock wall on one side and a steep cliff on the other (Figure 12). A small section of the Trail of '98 was surveyed adjacent to the railroad track and was found devoid of invasive plant species. One archaeological site, an old plane wreck, was found while conducting the White Pass Unit Survey. This site was mapped and photographed and the Cultural Resources department was informed of the details.

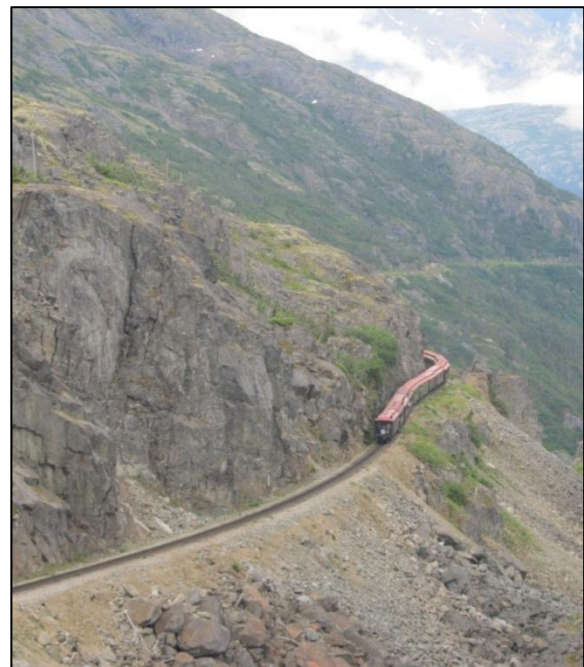


Figure 12. A train along the southernmost limit of the surveyed area in the White Pass Unit.

A map of invasive plant species on the Klondike Highway can be found in Appendix K and a map of the survey of White Pass conducted this season can be found in Appendix L.

Outreach and Education

Efforts to educate the general public on the issue of invasive plants were emphasized in the 2011 season. Educational material produced early in the 2010 season was modified and distributed to businesses and to the general public. These materials educated people on what invasive plants are, the impacts associated with invasive plants, and why we are concerned. Other educational materials gave identification tips as well as ecological and aesthetic attributes of specific species.

Several talks were given about invasive plants during the 2011 season. An educational talk was given on edible invasive plants in Skagway by Jessica Wilbarger as part of the Friday night KLGO guide services. Samples of several different kinds of invasive plants prepared into food

were distributed after the presentation. A live radio interview was also conducted by KHNS radio in late June, broadcasting to Skagway and Haines. SCA EPMT crew member Zachary Goodrich was interviewed about invasive plants in Skagway, why they are a problem to the locality, and what people can do to aid in control work. The July 1st community weed pull was pitched over the radio. On a personal Chilkoot Trail hike, KLGO EPMT staff gave a talk to hikers during a Sheep Camp evening program with the Sheep Camp park ranger. Hikers were informed about invasive plants of the area, what species are most likely to be found on the Chilkoot trail, and what to do if an invasive plant is identified. Hikers were shown samples of tall buttercup growing in the campground vicinity of Sheep camp.

An unofficial partnership was made with several tour guides at Sockeye Cycles, a local Skagway bike shop specializing in tours. Bicycle tours in Dyea, on the Klondike highway, and in Skagway often passed KLGO EPMT staff doing surveys or control work. Brief five minute talks were occasionally given to the 10 – 20 person bicycle tours about invasive plants and what the current status is concerning invasive weeds both statewide and locally.

As was done in 2010, KLGO EPMT staff made a connection with the Skagway Public Library early in the season and was able to secure the library display case for an invasive plant display from June through August (Figure 13). The display featured a specimen of the eradicated spotted knapweed found in the area and live specimens of common invasive plants in Skagway and what kinds of problems they cause. The display was also a venue to advertise for the Skagway Community Weed Pull hosted on July 1st. A total of 17 people volunteered for 3.5 hours each, and pulled 118 pounds of invasive plants at the airport. Volunteers successfully removed all detected white sweetclover at the airport as it had been drastically reduced in density from last year. An hour was available after pulling white sweetclover to tackle the dense area of narrowleaf hawksbeard growing along the northern end of the fence. This patch of hawksbeard was fully treated and was adjacent to the patch which SAGA had treated on the other side of the airport fence. Volunteers received a Skagway Community Weed Pull shirt for their efforts and lunch organized and donated through the TIWC. The TIWC proved to be an instrumental partner in the season's work and were notified whenever high priority invasive species were found along Pullen Creek. The KLGO EPMT staff attended a TIWC board meeting and presented information about the reed canarygrass infestation at Pullen Creek and possible control methods.



Figure 13. The KLGO EPMT invasive plant display at the Skagway Library.

The KLGO EPMT staff also participated in Junior Ranger Day, an event that hosted both local and vacationing participants. Library staff set up a table where children were invited to create their own pressed plant bookmark. Invasive species coloring pages with crayons were handed out by the KLGO EPMT staff and an invasive or native plant matching game was set up with photos.

Gypsy Moth Monitoring

The 2011 season was the first time EPMT staff at KLGO participated in gypsy moth monitoring. Five gypsy moth traps were set out in mid-July, three in Skagway, and two in Dyea. Tom Keough, the Agricultural inspector at the Skagway U.S. border station is also participating in a gypsy moth monitoring program with the U.S. Forest Service, using similar traps. Efforts were coordinated to place traps in different locations to improve the area monitored by traps. All five traps were collected in early September. No moths were found in the traps. A map of the trap placement can be found in Appendix O.

Discussion

Recommendations for invasive plant management during the 2012 season center on adopting an approach to management that focuses on early detection and eradication in backcountry and undeveloped front country areas and containment on road systems and in the town of Skagway. Recommendations are divided up by cultural resources integration, work area, survey work and outreach. Recommended prioritization strategies are based on gross species acres recorded in 2011 and ranking, are summarized in graphs in Appendices D and E, with information on how to create these graphs through data extraction from the AKEPMT database in Appendix F.

Survey Work

Surveys are a vital component of invasive plant management. Early detection of species will help control infestations before they take over. For example, reed canarygrass found at Sheep Camp during the Chilkoot trail survey initiated a rapid plan for control work, addressing the issue before the infestation could spread further along the Chilkoot trail. The Table 3 shows the date, amount of time, and personnel needed to conduct the surveys.

Table 3. Summary of invasive plant surveys conducted in 2011

Date	Survey Location	Personnel	Time
Throughout Season	Municipality of Skagway	1	-
Throughout Season	Dyea	1	-
6-15	Slide cemetery and road to Lost Lake trailhead	1	4 hours
6-29	Dyea North meadow	8*	2.5 hours
6-30, 7-20	Dyea road and campground (between West Creek bridge and campground)	6*	7 hours
6-30, 7-20	Dyea townsite road (between Dyea road and Alaska Excursions parking lot)	6*	7 hours
7-1	Airport	1	3 hours
7-21	Lost Lake trail	4*	2 hours
7-27	Dyea road (between Klondike Highway and campground)	1	14 hours
8-2, 8-4	White Pass Unit**	1	1.5 hours
8-8, 8-9, 8-15	Klondike Highway	1	13 hours
8-21	Chilkoot Trailhead to Sheep Camp**	4	8 hours

Time estimates do not including travel time to get to the survey location.

* Conducted with SAGA crews, control work was done while surveying.

** White Pass and Chilkoot surveys were conducted on overnight backcountry hiking trips

It is recommended that the airport, the Chilkoot trail the Dyea Road, and the Klondike Highway be surveyed every year while the Lost Lake trail and White Pass Unit are surveyed every other year. Areas in Skagway and Dyea should be surveyed thoroughly and regularly. A map of the all inventoried area can be found in Appendix G.

Nelson Slough Restoration Site and the Dyea Unit

Eradication efforts of common eye-bright take precedence in the Nelson Slough Restoration Site. The common eye-bright infestation near the Nelson Slough Bridge was small and took only two hours to control in 2011. This site should be targeted for eradication in 2012. Dyea's other two large infestations of common eye-bright have seen little progress in extent reduction. As work is long, tedious and overall ineffective with 1-2 people in the management of these large infestations, request for preference of SAGA crew work times should be placed for early August

to work on one of the two patches of common eye-bright. A group of 8-10 hand pulling on the edges of a common eye-bright infestation would be much more effective.

Control work should be prioritized on creeping buttercup infestations. This work is best conducted with two to four people as the infestations are manageable. Surveying Lost Lake Trail is unnecessary, but revisiting the location of the creeping buttercup by the trail steps, just up from the trailhead, is a priority.

Focus on the tall buttercup throughout Dyea takes second priority to the creeping buttercup, though the tall buttercup infestations are better suited to larger working groups. Work on eradication of tall buttercup in the Nelson Slough Restoration site, on the Dyea Flats and the meadow to the south of the restoration site is most important. Surveys should be conducted for tall buttercup in the large field north of the flats, adjacent to the Taiya River and across from the rafting pull-out. The small infestations at the north end of this field are not located near any trail or human traffic area and are good candidates for eradication. Tall buttercup should be uprooted along the Townsite Road if time allows for it, though eradication is more important in the meadows supporting thriving native plant populations and on the Dyea Flats.

Monitoring for narrowleaf hawksbeard between the Taiya River Bridge and Dyea Campground are important for the 2012 season, because no plants were found in the past two years and the possibility to eradicate this species entirely from Dyea is strong.

Chilkoot Trail

Surveying the Chilkoot Trail up to Sheep Camp should now be done every year since reed canarygrass has been found so far up the trail. Detailed monitoring through all parts of Canyon City and Sheep Camp are important, as these are high traffic areas where invasive plants have been found before. Helicopters also periodically unload supplies at these two locations. Surveys should be done between mid-July and early-August to ensure phenology to properly identify reed canarygrass, and to prevent the spread of seeds. Inflorescences should be cut from any reed canarygrass plants found and infestations should be considered for further treatment at a later point in the season. Covering with black plastic and geotextile or digging out root systems are appropriate actions based on the size and locality of the infestation along the trail.

The geotextile and plastic cover placed down over reed canarygrass infestations at Sheep Camp in 2011 should be checked by EPMT staff at least once during the season in 2012, and the outside perimeters of the cover should be examined for any newly emerging reed canarygrass. Any newly recorded small patches (a few individual plants) of reed canarygrass should be thoroughly dug out and bagged, provided compliance for this work has passed. Efforts should be coordinated with park rangers stationed at Sheep Camp, as well as trail crew when working in the area, to regularly check that covers are secure on the ground (Figure 14). The earliest removal date for the

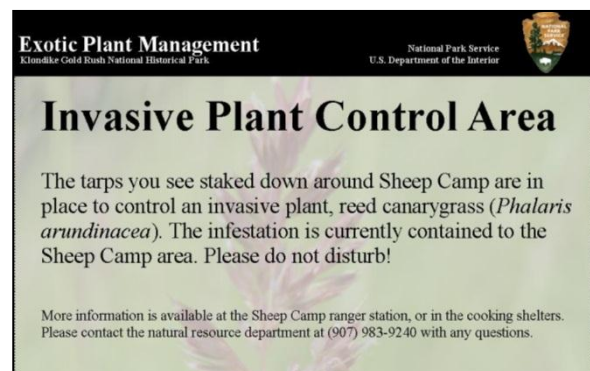


Figure 14. Reed canarygrass tarping project signs posted in the Sheep Camp area.

covers is at the beginning of the season in 2013 after being covered for one full growing season, though seeds may be viable longer than one growing season, and leaving covers for an additional season would better ensure success. Covers should then be assessed for the need to be altered or replaced each year.

Revegetation is a major priority when covers are removed, and should be conducted as part of the same project. Revegetation plans should be detailed and finished before covers are removed. Local transplanting of alders into the area is a viable option, with little materials or cost. Alders can form dense thickets and would be good in shading out any possible reed canarygrass that might come up in the treated areas. Another option would be to obtain native grass seed from a certified source, or to collect a mixture of native seeds from the area in 2012 and 2013 to spread over the treated areas when covers are removed.

Infestations of tall buttercup are second priority to reed canarygrass, but control work should be done if possible around the Sheep Camp campground, and on the trail between the campground and the ranger station.

Dyea Road

The bicycle survey of the Dyea road this year provided a better understanding of invasive species threatening the Dyea Unit of KLGO. The highest concentration of invasive species occurred within the first two miles of the Dyea Road closest to Skagway. Though control work on the Dyea road was not done in 2011, it is important within the first two miles, with a focus on stopping the spread of yellow toadflax and narrowleaf hawksbeard along the road. Oxeye daisies are located in several spots along the Dyea Road, though some property owners have expressed concern over the park pulling them. It is recommended that control work be conducted right before the oxeye daisies go to seed and only on public property. Talking with landowners could be useful about pursuing other options, such as replacing the invasive oxeye daisies with the native arctic daisy (*Chrysanthemum alaskanum*) and the reasons for controlling this highly invasive plant, though concern should be taken not to overstep jurisdiction. Containment of the oxeye daisy plant should be the main priority and preventing the existing plants on NPS lands from going to seed will help with that mission.

Monitoring the reed canarygrass along the Dyea road should be a priority for 2012, along with the infestations on the Klondike Highway. Inflorescences should be cut in late July to prevent the spread of seed. Working with the municipality of Skagway, Alaska DOT, and the TIWC to control the small reed canarygrass infestations, possibly with herbicide, and attempt eradication are the highest priority on the Dyea road for 2012.

Besides the control of the first two miles of the Dyea Road, the reed canarygrass, and the oxeye daisies, work on the Dyea Road should focus on containment of existing infestations. Working with a larger crew to clip flower heads to prevent them from going to seed will help. If time allows, control work should be started along the road just after the Dyea campground and move towards Skagway.

Skagway

Control work in Skagway should continue to focus on preventing the spread of the most invasive plants outside of Skagway. The spread of white sweetclover to roads off the Klondike Highway,

shows how challenging this can be, but should be a reminder of the continued vigilance necessary to keep this species as limited as possible in heavy transit areas. Thus, continued control work on white sweetclover in and around the airport is a priority. The 2009, 2010, and 2011 seasons were successful in pulling all of the found white sweetclover plants in and around the airport before going to seed. This practice should be continued along with the control of other invasives found nearby. The north end of town between the airport fence, Taiya River, and Main Street should be surveyed more thoroughly in 2012. Several small patches of white sweetclover were noted on properties which were regularly mowed. Working with community members Joanne and Andrew Beierly in monitoring for white sweetclover was very helpful in 2011 and should be continued in 2012. Events like the Community Weed Pull have been integral in the control of the white sweetclover at the airport and should continue.

Additionally, as the town is surveyed, any and all white sweetclover plants should be pulled if at all possible. The species has become notorious to many in Skagway and most property owners will respond positively to the removal of the plant with prior permission. Outreach to more landowners in Skagway is the next step towards eradication. Native plant seed, or transplanted natives could be offered as a replacement for white sweetclover removed from private property.

Assisting the TIWC with monitoring and control work at Pullen Creek should continue. The TIWC has been an essential partner in community outreach and has been very responsive in learning about the invasive plants in Skagway. The TIWC may have its own invasive plant intern in 2012, and coordinating efforts with monitoring and pulling would be a high priority. This opportunity may give EPMT staff more time in 2012 to focus on further monitoring and more extensive control work on park lands and elsewhere. Efforts should be coordinated with the TIWC to prioritize treatment of the reed canarygrass at Pullen Creek. Full treatment could consist of mowing and covering or herbicide, but the infestation is too large to be dug out manually, as root systems and rhizomes are dense and much time is needed in care to remove all fragments. Root fragments left at the site or washing downstream can propagate into new plants.

Monitoring for the perennial sowthistle infestations not found in 2011 in and around the airport is a high priority for 2012. Infestation acreage in 2009 and 2010 suggest an eradication in 2011 is unlikely, so a confirmation on the status of this species in 2012 is important.

A plan to control the bird vetch on Spring and 9th Streets should be a priority for the 2012 KLGO EPMT program to help the TIWC, and also to prevent any chance of spread to areas of the park. The best way to do this would be in working with the city and possibly the TIWC to apply an herbicide. Discussions of control of this infestation should start early in the season, and a plan must be made before application is possible.

It will be important to monitor the five identified locations of ornamental jewelweed in 2012. Monitoring near the site on 20st and State Street behind You Say Tomato should continue, but from outside private land, unless permission is obtained from the landowner. Landowner information can be found in Skagway GIS property data. Outreach to the landowner is highly recommended in 2012. Ornamental jewelweed, a particular problem in wetland and riparian ecosystems, has spread into a very small drainage on the eastern side of the property. The site on 4th Street across from Starfire should be monitored as well, and controlled with the property owner's permission. The property owner of Dedman's Photography on Broadway was not

willing to remove the ornamental jewelweed in 2010, but another attempt at outreach should happen in 2012. The owner of Corrington's Alaskan Ivory was contacted and informed of the effects of ornamental jewelweed in 2011, but was unwilling to remove the plants outside of their shop. The owner did admit to spreading ornamental jewelweed seed at Pullen Creek in the park at 6th street where the fifth infestation was found. Although all plants were removed before going to seed, EPMT staff in conjunction with the TIWC should monitor this area and other parts of Pullen Creek for ornamental jewelweed and remove all plants when found. Seeds are viable for up to two years and there is no guarantee that seed won't be spread out again in 2012. Areas around Dedman's photography and Corrington's Alaskan Ivory should be monitored later in the season of 2012 for the spread of ornamental jewelweed and outreach efforts should be made with both owners.

Seven pastures municipal fill site, next to the Frisbee golf course and the baseball fields is a possible site of origin for new invasive plants into the park and also a point source of spreading if fill is taken to other locations around the area. Both tall and creeping buttercup were found in this location along with many lower priority species. The potential to spread white sweetclover is high if landowners dump fill contaminated with seed here. An interpretive sign created at seven pastures in cooperation with the municipality of Skagway and the TIWC could be a good opportunity for education to those that use the fill site.

Regular work should begin at the KLGO maintenance yard controlling yellow toadflax. Equipment and material around the maintenance building has the potential to spread this species further throughout Skagway, and into areas of the park including Dyea.

Other areas important for monitoring are the semi-truck parking lot near petromarine services and the airport, the railroad tracks on the north end of town and Pullen Creek pond.

Klondike Highway and White Pass Unit

Control work on the Klondike Highway and in the White Pass Unit should be increased from years prior. A Klondike Highway road survey should be conducted starting at the northernmost section of the White Pass Unit adjacent to the road. Species of concern along the highway include: reed canarygrass, white sweetclover, yellow toadflax, common tansy and oxeye daisy. Portions of the Klondike Highway are in the White Pass Unit and a thorough understanding of the threat of invasive species for this pristine unit of the park is important. Another survey of the White Pass Unit along the train tracks could be helpful in 2012, though the survey is not recommended to occur every year, as only dandelion and white clover in small amounts have been found. It is recommended that the White Pass Survey be conducted over a two day backcountry trip due to the time needed to hike to the train tracks from the Klondike Highway. Another option would be to work with the White Pass and Yukon Route to coordinate a drop off and pick up time for backcountry survey efforts. The focus of the survey should be on the land adjacent to the railroad tracks.

Control work in the White Pass Unit and on the Klondike Highway should focus on the most aggressive invasive plants—reed canarygrass and white sweetclover being the most important to control. A quarry on private land, on the west side of the highway just south of the black lakes, contains the highest density of white sweetclover with the largest plants in the area. Contact should be made with the landowner (found in Skagway GIS data) and control work should be

done if at all possible. Digging might be a viable control method depending on how easily the plants are removed with roots, although application of herbicide to this patch seems like the most effective option.

The large patch of oxeye daisy found just north of mile marker 10 in a pull-off on the east side of the road could be a good SAGA control project. The pull-off is large, making a safe work area with plenty of room for parking, and the infestation is too large to effectively be managed by one person.

Very small amounts of high priority invasive species, including white sweetclover, reed canarygrass, and yellow toadflax, were found along the northernmost four miles of road, and control work to prevent spreading into the easterly adjacent White Pass Unit should be a priority in 2012.

Wind and Seed Dispersal Considerations

The strong summer south wind that rushes from the cold Pacific into the warm continental interior has a strong effect on the dispersal of seed for many plants growing in the Skagway area. Many invasive plant species found in the Skagway area, such as narrowleaf hawksbeard, and common dandelion are regularly dispersed by wind. The strong south wind in open areas such as the Skagway airport and the Dyea flats can also move larger, less mobile seeds such as those of tall buttercup, considerable distances. Known introduction points, or high density areas, followed by decreasing densities of a species to the north of these locations are often evidence of wind dispersal.

The large tall buttercup infestation near the campground in Dyea shows this effect, as does white sweetclover from the southern airport area and adjacent neighborhood. Narrowleaf hawksbeard, an aster species highly dependent on and adapted to wind driven seed dispersal, is found at very high densities just north of the airport, and sporadically moving north on the lower half of the Klondike Highway.

For effective containment strategies in 2012, it is recommended that when hand pulling in open areas, work should begin on infestations from the north end, moving south. This practice will help to contain species with wind-driven seed dispersal mechanisms to their southern limit, as north winds during the summer and early fall are rare.

Cultural Resources Integration

Due to the historical significance of KLGO a meeting on proper cultural resources field methods should occur annually. Additionally, any time control work is conducted in the Dyea Townsite all workers should be briefed on what to do if a cultural artifact is found. Possible artifacts or archaeological sites found while conducting surveys should be photographed, mapped and discussed with the Cultural Resources department.

Outreach and Education

Outreach pays dividends well beyond the hours of the presentation or volunteer day. In a place like Skagway where invasive plants outstrip the ability of park staff to control them, connections between the park, land owners, and any potential volunteers are vital. Partnering with the TIWC on outreach activities should continue in the future as the group is a great community resource.

Surveying and control of areas in Skagway and along the Skagway and Taiya rivers should be coordinated with the TIWC if they employ an invasive plant specialist in 2012.

Once again, the Community Weed Pull proved to be a successful tool for control of invasive plants and education of the public. Many volunteers look forward to it on a yearly basis suggesting the event should continue and grow. The refreshments, lunch and t-shirt provided for hours of hard work are great outreach tools and have proved to keep people coming back year after year. Including a display with edible weeds as snacks and highlighting other uses of invasive species would be a great addition to the event. Partnership with the DOT in this event should continue and expand to other work and events.

As suggested in last year's report, another event which could be added is a Skagway Survey Day. The KLGO Education Specialist could help put the event on with local Skagway youth or community groups. The purpose would be to break up into teams and survey the entire town of Skagway—finding, identifying and learning about invasive plants in town. This type of event will help in survey efforts and educating the public. It could potentially save days of survey work that would otherwise be done with only a few people. Hosting the event two weeks before or after the Community Weed Pull would ensure that invested volunteers would be a part of them both. A Radio interview with KHNS conducted before the Community Weed Pull was an excellent way to get the community thinking about invasive plants and advertise for the weed pull at the same time. Setting up a radio interview to discuss invasive plants in the area and what issues they pose in Skagway would be a great way to let the community know about pertinent issues of 2012.

Another event to host could be asking citizens to trade in bags of weeds for T-Shirts. An abundance of T-Shirts left over from the last two years of Community Weed Pulls could be used as prizes if people around town pulled 15 pounds of selected invasive plants from public or their own private lands in the Skagway area. Volunteers for this event should be prompted to come to the office to be given a bag, volunteer form, and information on where and where not to pull before they do so.

The library display proved to be a successful way to outreach to citizens and visitors of Skagway. Since the materials for the display are already provided, set up would be quick at the beginning of the season. The display is a great connection to keep up and should be updated and expanded in the future. A possibility for 2012 would be to focus part of the display on native plants of Alaska as a full restoration approach to education. This would work well with another KLGO initiative, the creation of a native plant garden in Skagway. This garden should also be viewed as a great outreach opportunity as it will be created by youth of Skagway with the help of the KLGO Education Specialist. Invasive plant education has the potential to be better received when native plants make up a portion of the educational material. Working on the native plant garden, and helping to educate locals on the importance of native plants will provide great ground for increasing conversations about invasive plants and controlling them.

Outreach to individual landowners has the potential to do a lot of good, but should be done with care. A great way to outreach to individuals comes in the form of informed community groups that care about a subject enough to talk to their neighbors about it. Expanding the EPMT

program's relationship with Skagway youth and the Garden Club and working with them to reach out to others may be the best possible way to connect with individual land owners.

KLGO Natural Resources Invasive Plant Collection

If time allows in 2012, work should be done on the collection of pressed invasive plants in the natural resources office. Pressed plants are the best level of proof that certain invasive plants exist in the area, and also aid in identification purposes for other park staff. The collection was started in 2010 with a few samples collected. The following species, which have been documented around the Skagway area, need to be added to the collection:

<i>Anthemis arvensis</i>	<i>Lepidium densiflorum</i>	<i>Rumex crispus</i>
<i>Bromus inermis</i>	<i>Lupinus polyphyllus</i>	<i>Senecio viscosus</i>
<i>Capsella bursa-pastoris</i>	<i>Medicago lupulina</i>	<i>Senecio vulgaris</i>
<i>Cerastium fontanum</i>	<i>Papaver nudicaule</i>	<i>Silene cucubalus</i>
<i>Chenopodium album</i>	<i>Phalaris arundinacea</i>	<i>Sorbus aucuparia</i>
<i>Collomia linearis</i>	<i>Phleum pretense</i>	<i>Stellaria media</i>
<i>Crepis tectorum</i>	<i>Plantago major</i>	<i>Tanacetum vulgare</i>
<i>Elymus repens</i>	<i>Poa pratensis</i>	<i>Viola tricolor</i>
<i>Erysimum cheiranthoides</i>	<i>Polygonum aviculare</i>	<i>Thlaspi arvense</i>
<i>Euphrasia nemorosa</i>	<i>Polygonum convolvulus</i>	<i>Trifolium repens</i>
<i>Galeopsis tetrahit</i>	<i>Potentilla gracilis</i>	<i>Tripleurospermum inodorum</i>
<i>Galeopsis bifida</i>	<i>Ranunculus acris</i>	<i>Vicia cracca</i>
<i>Hordeum jubatum</i>	<i>Rumex acetosella</i>	<i>Taraxacum officinale</i>

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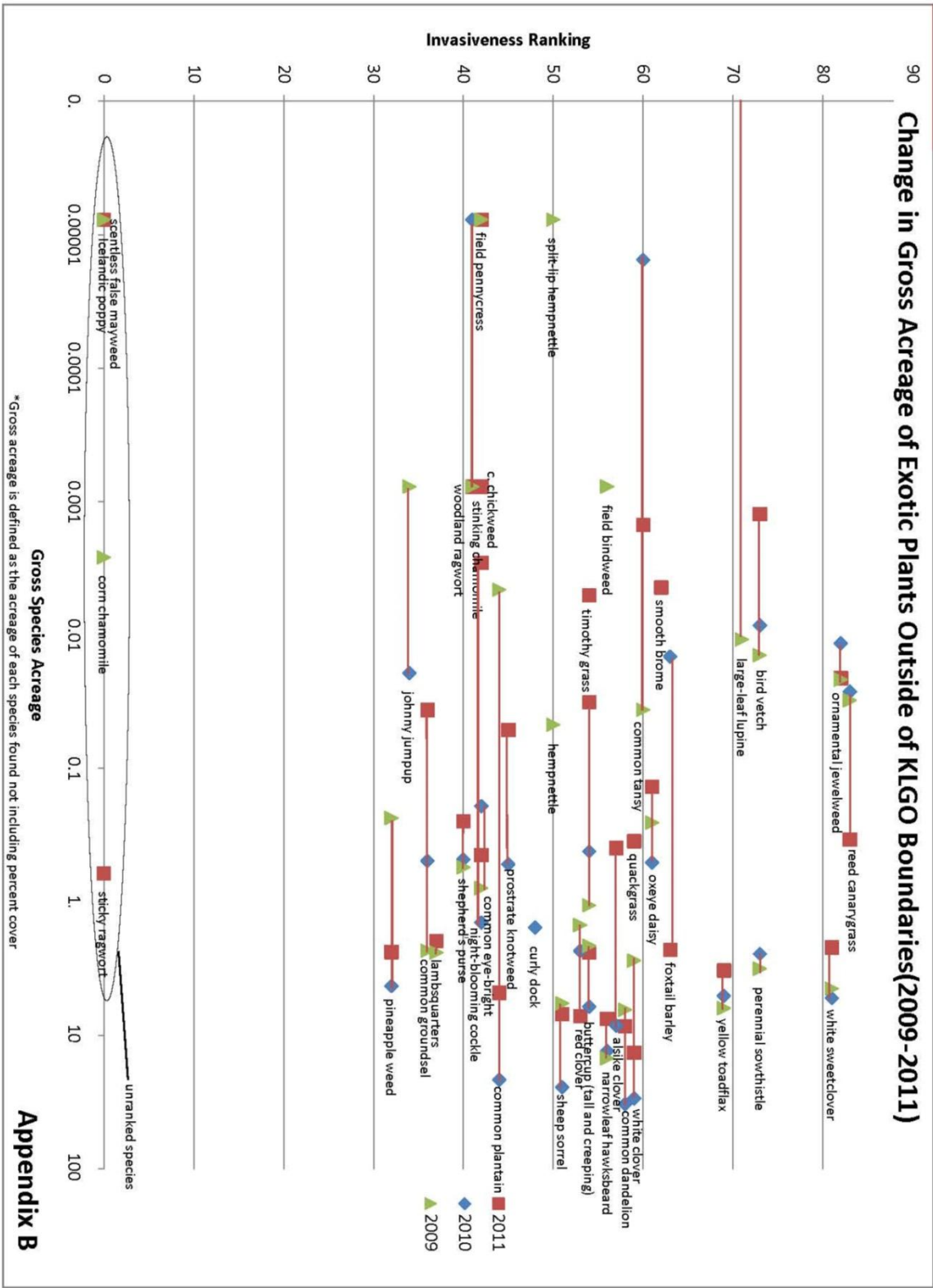
Appendix A. Klondike Gold Rush National Historical Park Exotic Species List and Known Locations.

Latin Name	Common Name	Chilkoot Trail	Dyea	Dyea Road	Klondike Highway	Skagway	White Pass
<i>Anthemis arvensis</i>	corn chamomile					X	
<i>Anthemis arvensis</i>	stinking chamomile					X	
<i>Bromus inermis</i>	smooth brome				XO	X	X
<i>Capsella bursa-pastoris</i>	shepherd's purse		X	XO	XO	XO	
<i>Cerastium fontanum</i>	mouse-ear chickweed		X	O	XO	XO	
<i>Chenopodium album</i>	lambsquarters		X	X	XO	XO	
<i>Collomia linearis</i>	narrow-leaved collomia				O	X	
<i>Crepis tectorum</i>	narrowleaf hawksbeard		X ERRAD	XO	XO	XO	XO
<i>Elymus repens</i>	quackgrass		X	XO	XO	XO	
<i>Erysimum cheiranthoides</i>	wormseed mustard		X	X		X	
<i>Euphrasia nemorosa</i>	common eye-bright		XO				
<i>Galeopsis tetrahit</i>	bristlestem hempnettle		X				
<i>Galeopsis bifida</i>	splitlip hempnettle					X	
<i>Hordeum jubatum</i>	foxtail barley		XO	X	XO	XO	XO
<i>Impatiens glandulifera</i>	ornamental jewelweed					XO	
<i>Lepidium densiflorum</i>	common pepperweed					X	
<i>Leucanthemum vulgare</i>	oxeye daisy		XO*	XO	XO	XO	
<i>Linaria vulgaris</i>	yellow toadflax		XO*	XO	O	XO	X
<i>Lupinus polyphyllus</i>	large-leaf lupine						
<i>Matricaria discoidea</i>	pineapple weed		X	XO	XO	XO	X
<i>Medicago lupulina</i>	black medic					X	
<i>Melilotus albus</i>	white sweetclover				XO	XO	
<i>Papaver nudicaule</i>	iceland poppy					X	
<i>Phalaris arundinacea</i>	reed canarygrass	O		XO	XO	O	X
<i>Phleum pratense</i>	timothy grass				XO	O	
<i>Plantago major</i>	common plantain		XO	XO	XO	XO	X
<i>Poa pratensis</i>	Kentucky bluegrass	X	X				X
<i>Polygonum aviculare</i>	prostrate knotweed		X	X	XO	O	X
<i>Polygonum convolvulus</i>	black bindweed					X	
<i>Potentilla gracilis</i>	slender cinquefoil		X				
<i>Ranunculus acris</i>	tall buttercup	XO	XO	XO	XO	XO	XO
<i>Ranunculus repens</i>	creeping buttercup		XO	O		XO	
<i>Rumex acetosella</i>	sheep sorrel	X	XO	XO	XO	XO	X
<i>Rumex crispus</i>	curled dock		XO	X		X	
<i>Senecio viscosus</i>	sticky ragwort		X	XO	O	XO	
<i>Senecio vulgaris</i>	common groundsel		X	X	X	X	X
<i>Silene cucubalus</i>	bladder campion		X	X			
<i>Silene noctiflora</i>	nightflowering silene					XO	

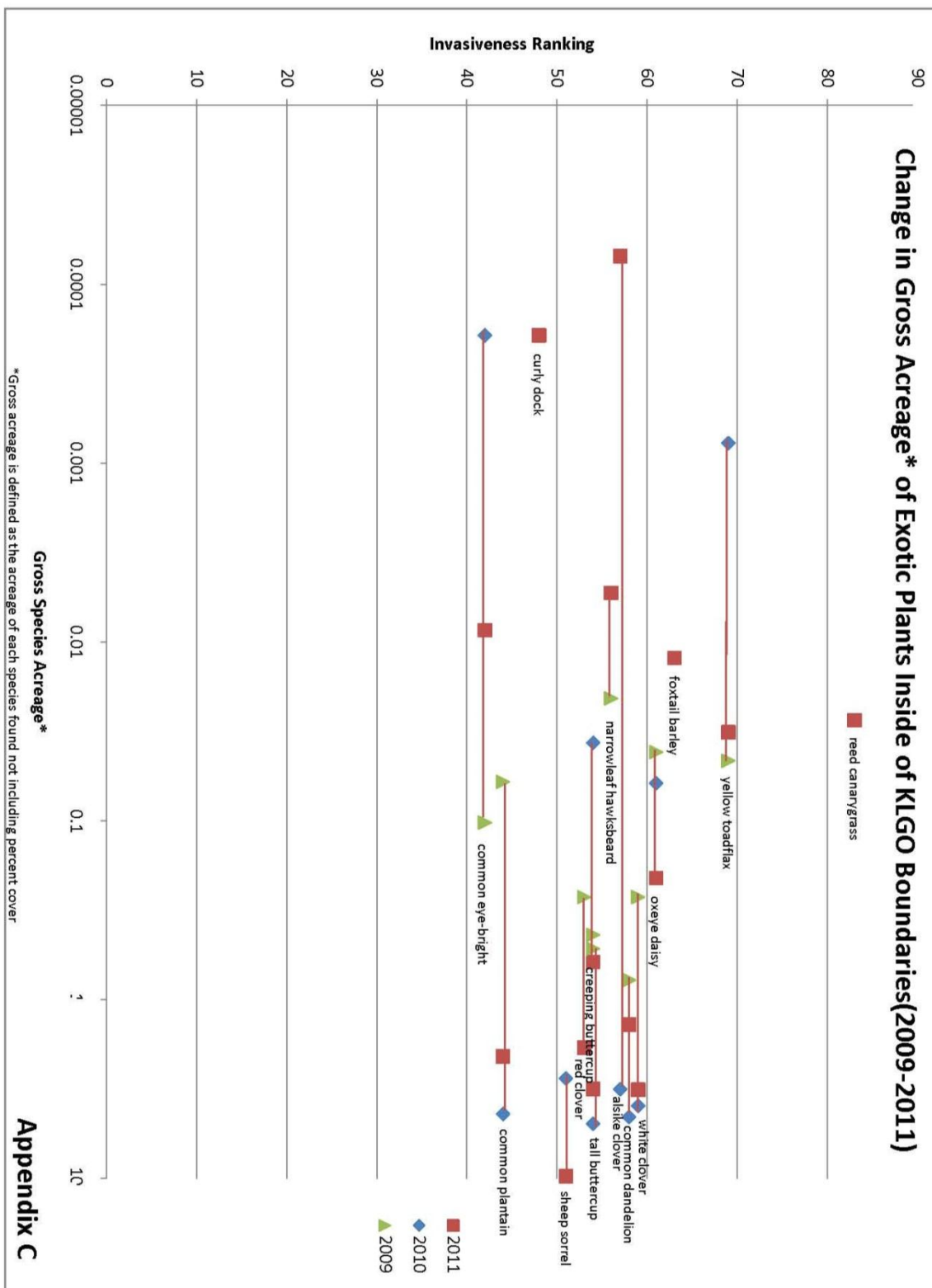
Scientific Name	Common Name	Chilkoot Trail	Dyea	Dyea Road	Klondike Highway	Skagway	White Pass
<i>Sonchus arvensis</i>	perennial sowthistle					X ERRAD	
<i>Sorbus aucuparia</i>	sorbus aucuparia					X	
<i>Stellaria media</i>	common chickweed		X	X	X	XO	X
<i>Tanacetum vulgare</i>	common tansy			XO*	O*	XO	
<i>Taraxacum officinale</i>	common dandelion	X	X	XO	XO	XO	XO
<i>Thlaspi arvense</i>	field pennycress		X		XO		
<i>Trifolium hybridum</i>	alsike clover		O	XO	XO	XO	
<i>Trifolium pratense</i>	red clover		XO	XO	XO	XO	
<i>Trifolium repens</i>	white clover	X	XO	XO	XO	XO	XO
<i>Tripleurospermum inodorum</i>	Scentless false mayweed					O*	
<i>Vicia cracca</i>	bird vetch					XO	
<i>Viola tricolor</i>	johnny-jump-up violet		X			X	

Notes	
X	Recorded in previous years
O	Recorded in 2011
*	Possibly eradicated in 2011
ERRAD	Not found in 2011, possibly eradicated
	Not found in within past two years, eradicated

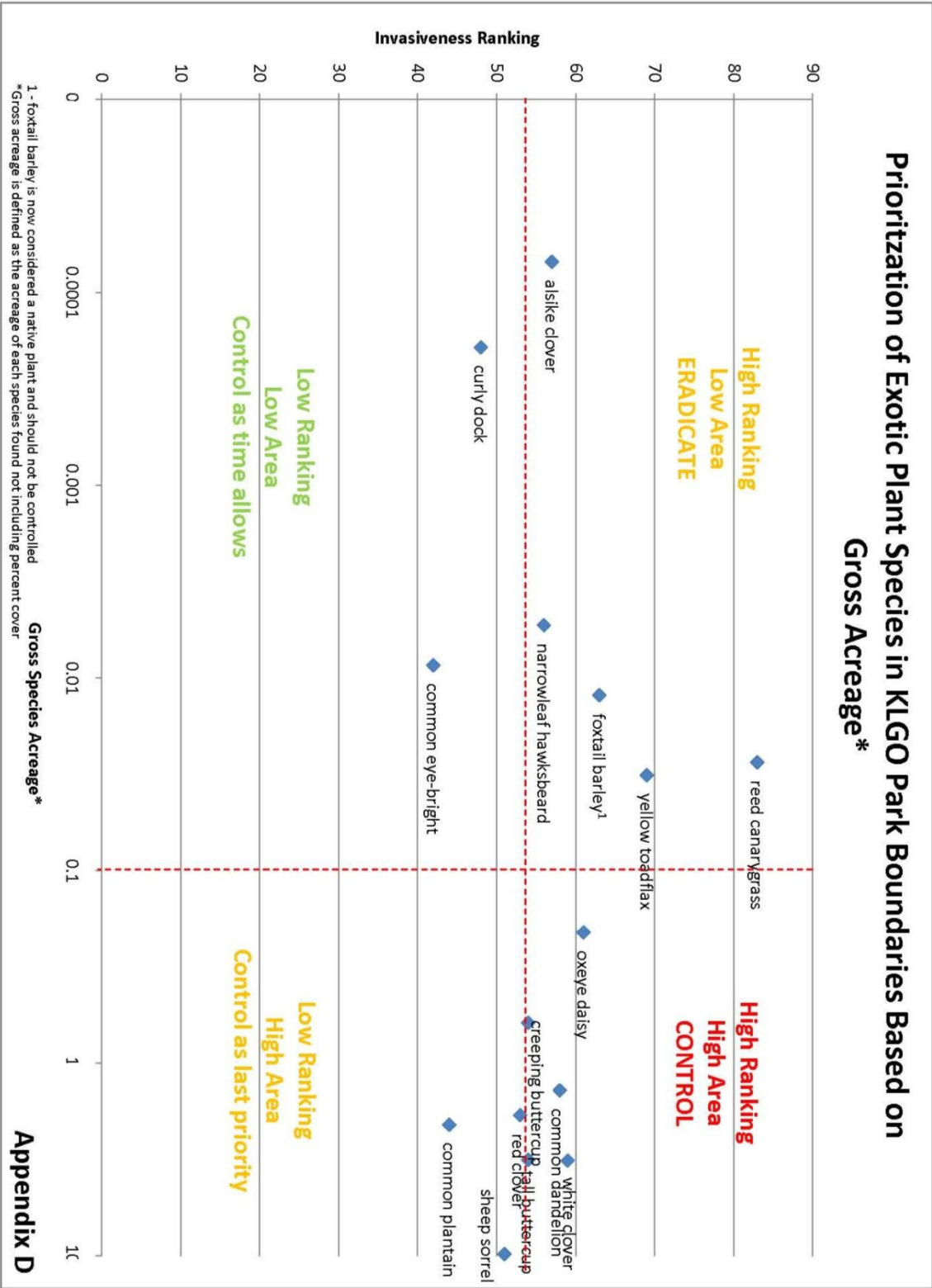
Appendix B. Changes in Gross Acreage of Exotic Plants Outside of KLGO Boundaries.



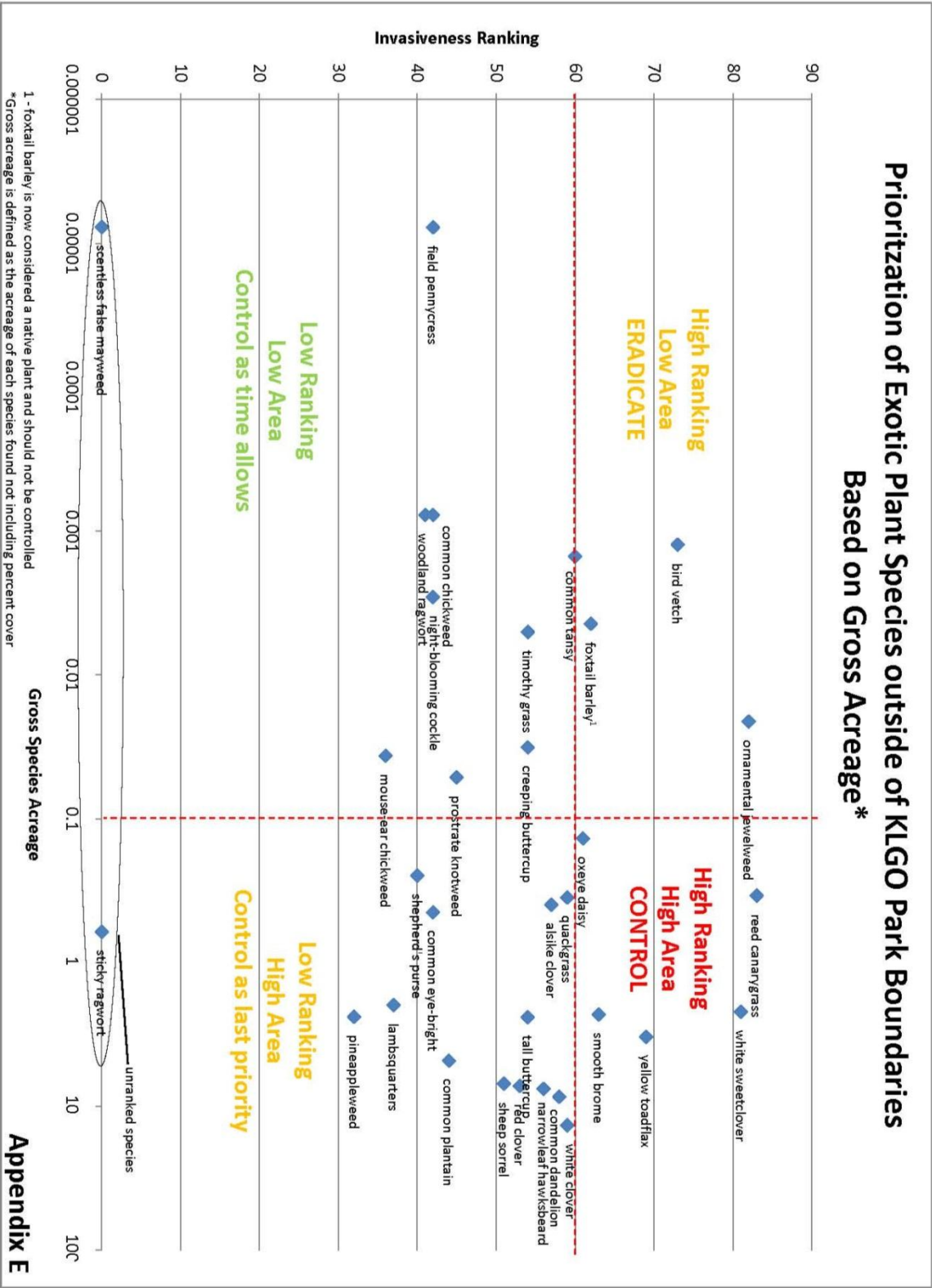
Appendix C. Changes in Gross Acreage of Exotic Plants Inside of KLGO Boundaries.



Appendix D. Prioritization of Exotic Plant Species in KLGO Park Boundaries Based on Gross Acreage.



Appendix E. Prioritization of Exotic Plant Species Outside of KLGO Park Boundaries Based on Gross Acreage.



Appendix F. Extracting Data from the Alaska EPMT Geodatabase to Create Gross Acreage and Prioritization Charts

Data used to create charts in the preceding appendices are gross acres of each species recorded. This data consists of all recorded GPS data in the AKEPMT Geodatabase filtered by year and park. This data is spatially “dissolved” by taxon in ArcMap so that several overlapping polygons recorded for a species (for inventorying, treatment, and several re-treatments of a site) do not count for each visit.

1. Load the AKEPMT Geodatabase (with the EPMT surveys layer) into ArcMap
2. Join the ranking attributes to the surveys layer

ArcToolbox > Data Management Tools > Joins > Join Field

- a. Input Table – surveys feature class layer
- b. Input Join Field – “Taxon”
- c. Join Table - “spp ranking” table included in the Geodatabase
- d. Output Join Field – “Taxon”
- e. Join Fields – “Ranking”

This will add species ranking to the surveys layer attribute table.

3. Use the query builder to show only the species data you want dissolved (this could be just by park, or by year and park for the purposes of this chart). The data should also not include polygons with a phenology of “not_detected” or “none” (areas surveyed but no species recorded).

Right click the surveys feature class layer > Properties > Definition Query tab > Query Builder

An example of code showing all recorded data which had an exotic species present at some level in KLGO inside park boundaries in 2011: (NOT [Taxon] = 'None') AND (NOT [Phenology] = 'not_detected') AND [Park_Unit] = 'KLGO' AND [Sample_Year] = '2011' AND [Is_Inside_Park] = 'Yes'

4. Run a dissolve on the data

ArcToolbox > Data Management Tools > Generalization > Dissolve

- a. Input = the surveys feature class layer you just queried
- b. Output = select a filename for the output

- c. Statistic fields = “Ranking” – Type = “First”
 - d. Check box – create multipart features (this will create 1 feature for each taxon)
5. Calculate the areas of the new dissolved polygons

ArcToolbox > Spatial Statistics Tools > Utilities > Calculate Areas

- a. Input feature class – the layer that was exported as result of the dissolve
- b. Output feature class – give filename

A new feature class is exported with calculated areas (you can remove the other layer (almost identical except for lacking the area attribute)).

6. Calculate acreage

Right click layer just calculated areas on > Open attribute table > Table Options > Add Field

- a. Name – “Acreage”
- b. Type – “Double” (number with decimal places)

Right click “Acreage” field > Field Calculator
 Acreage =[F_Area]* 0.000247105381

Where F_Area is the area in square meters. This is multiplied by the conversion factor to acreage.

7. Repeat steps 3 - 6 for each data set using the query (different years, parks, either inside or outside park boundaries, etc.)
8. Export for use in excel to make charts

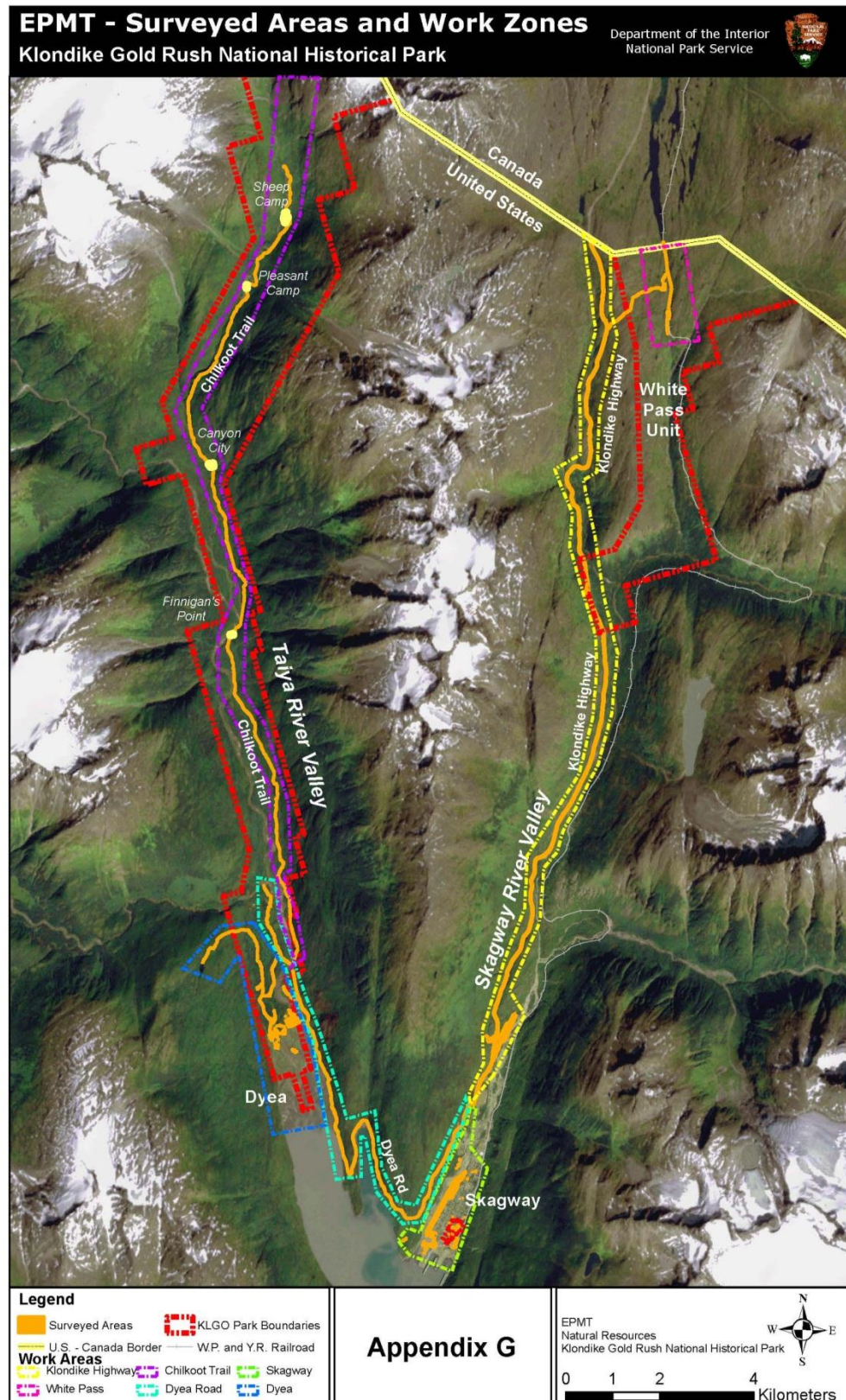
Open attribute table on the feature class you want to export > Table Options > Export

Select “All records” and a file name

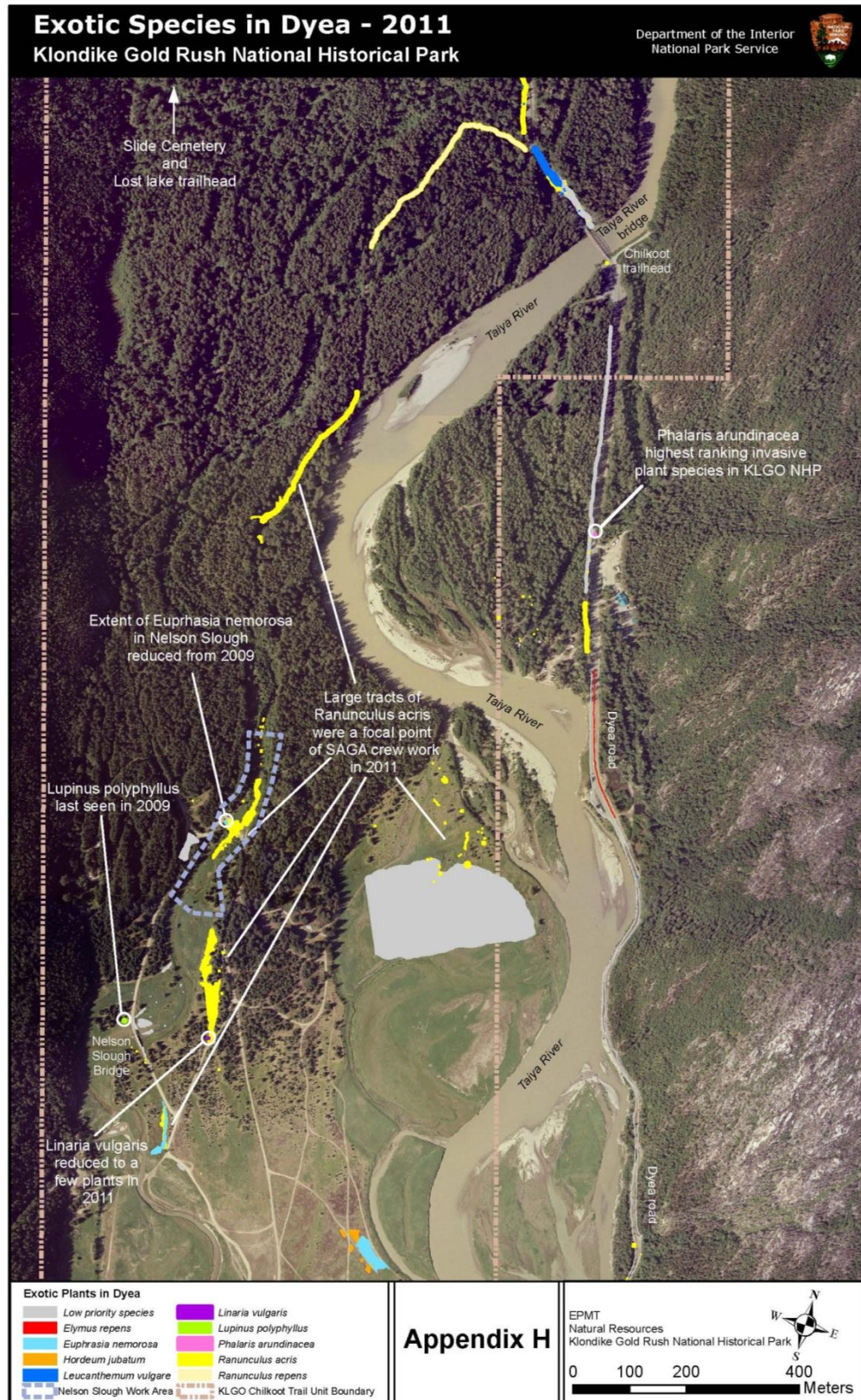
9. Make your chart by opening up the .dbf file you exported and saving it as a .xlsx. If using multiple years data, or inside/outside park data in separate series its easiest to use one workbook in excel, with each series data on different spreadsheets, and charts on separate spreadsheets as well. Put “Ranking” on the Y axis, and “Acreage” on the X axis. Using a logarithmic X-axis seems to work well.

Thanks to Whitney Rapp for the graph concept and for data manipulation help!

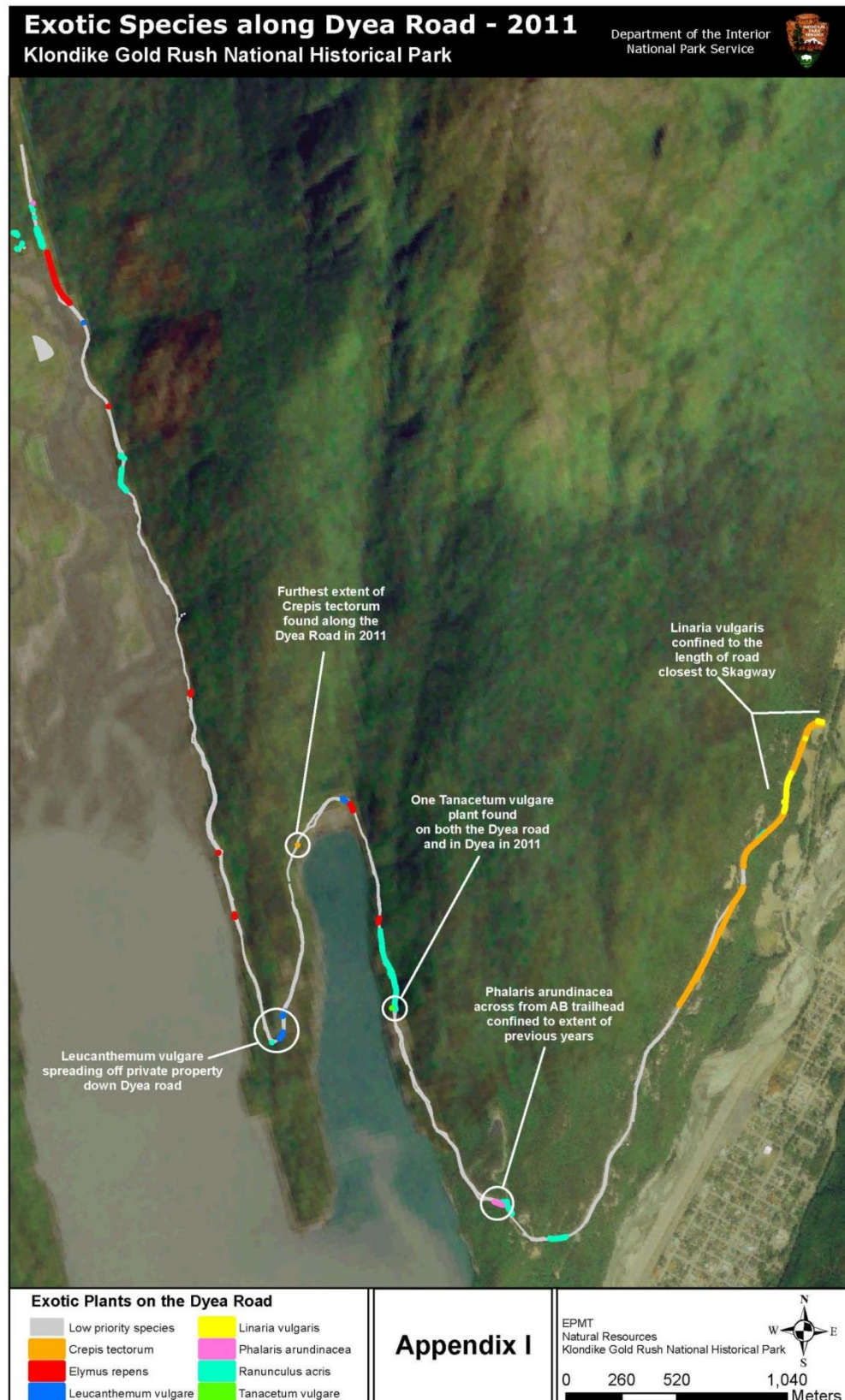
Appendix G. EPMT Surveyed Areas and Work Zones



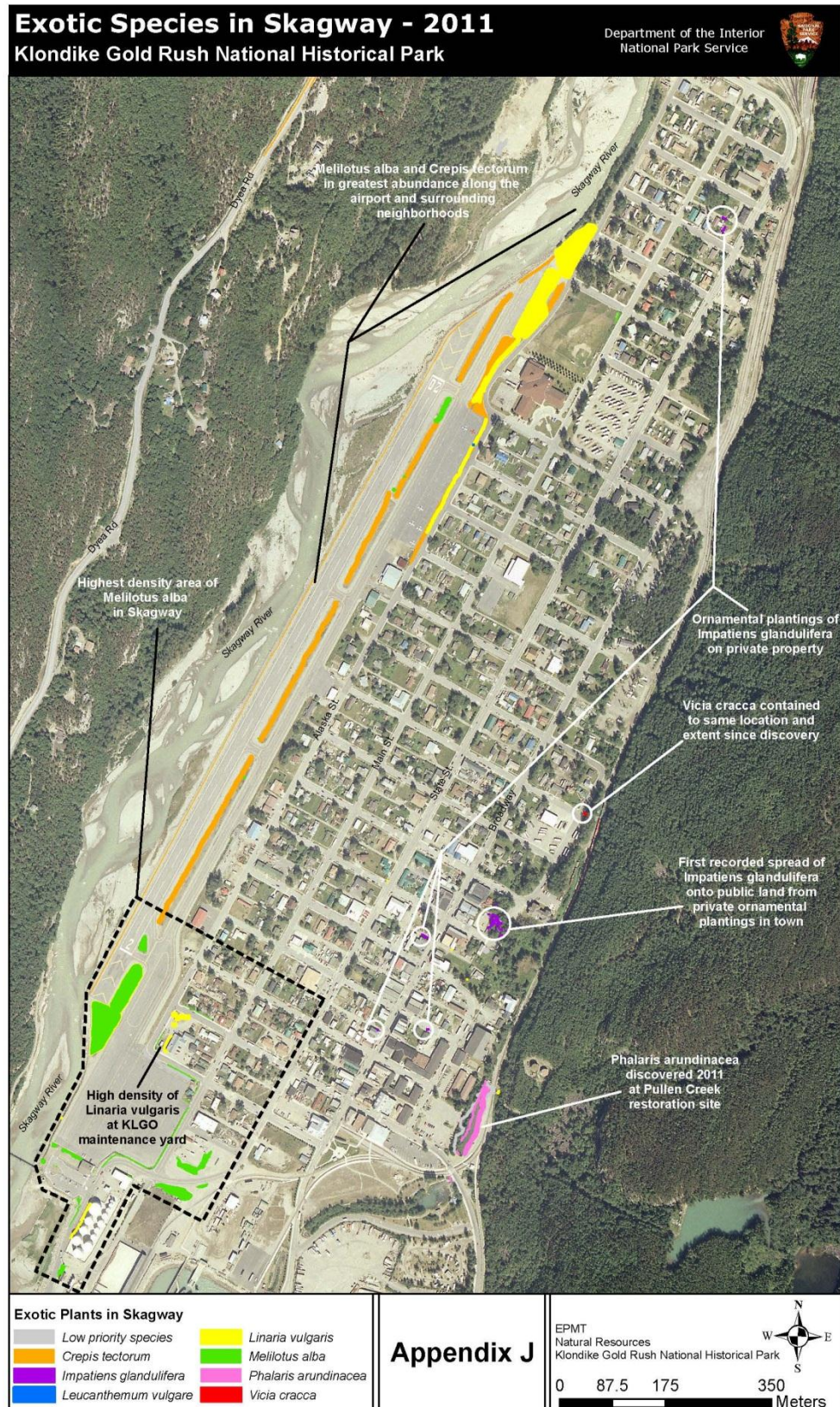
Appendix H. Exotic Species in Dyea



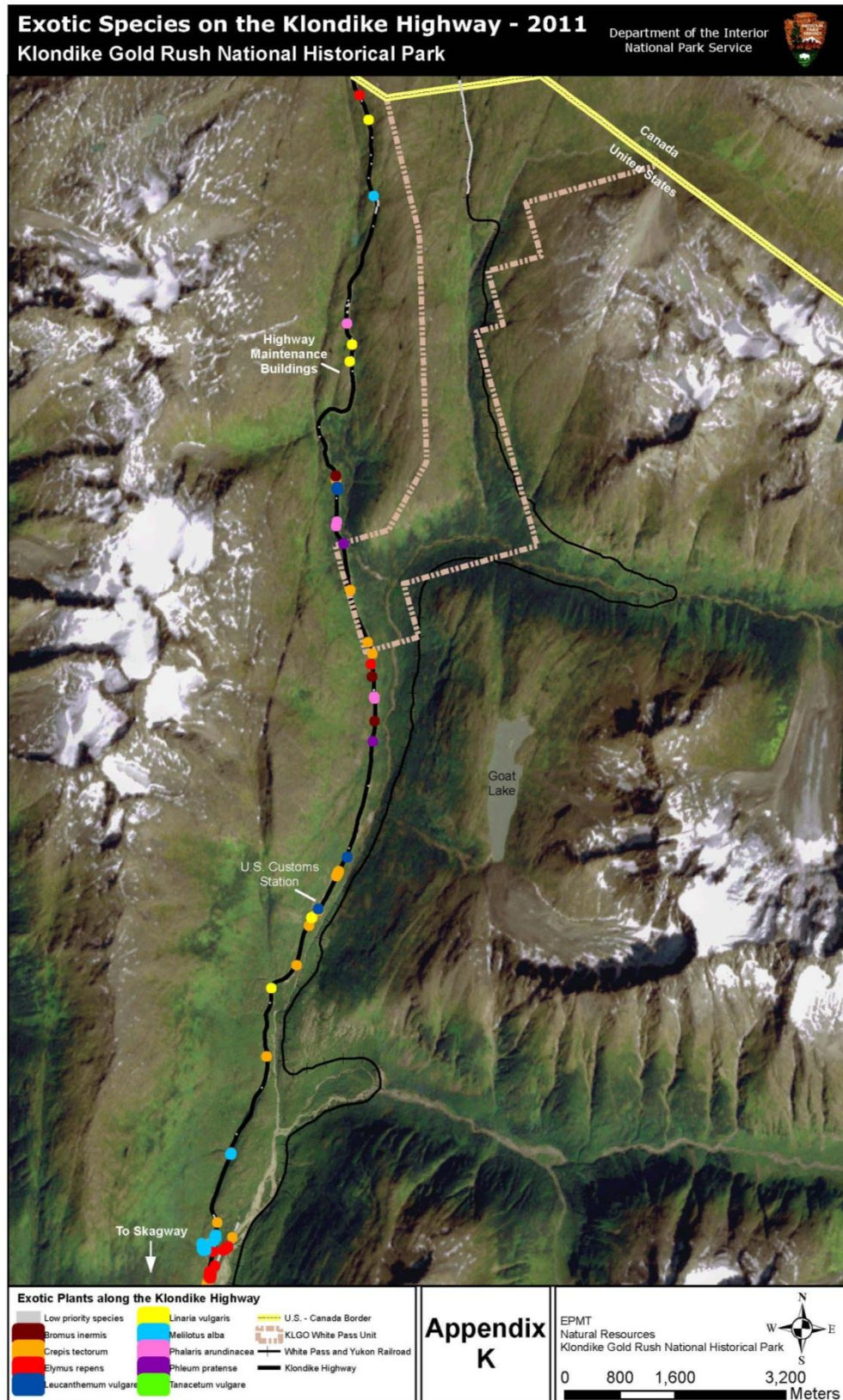
Appendix I. Exotic Species along Dyea Road



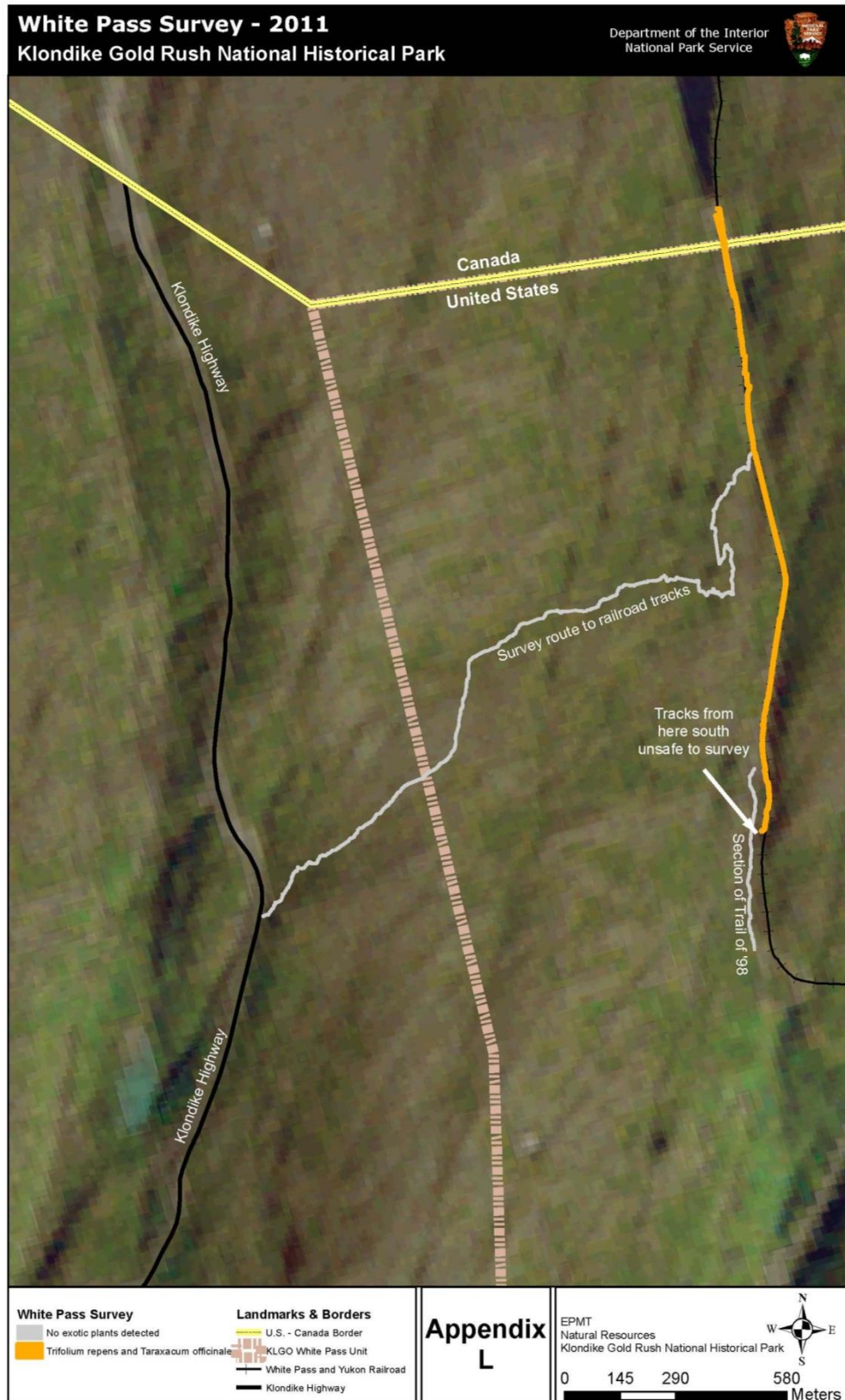
Appendix J. Exotic Species in Skagway



Appendix K. Exotic Species on the Klondike Highway



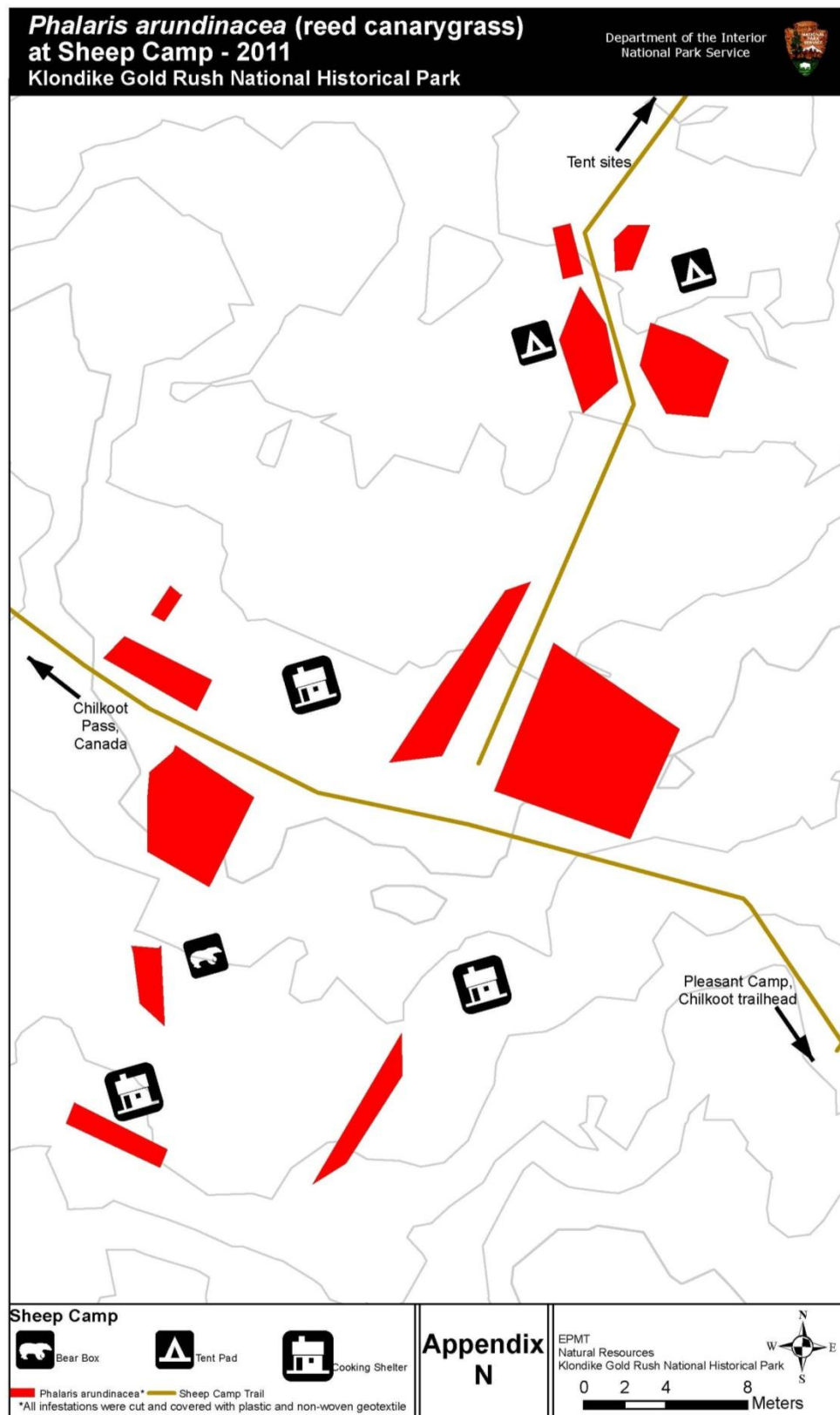
Appendix L. White Pass Survey



Appendix M. Reed canarygrass at Pullen Creek



Appendix N. Reed canarygrass at Sheep Camp



Appendix O. Gypsy Moth Monitoring

